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Department of Defense FY 1999 Amended Budget Estimates
February 1998

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RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE-WIDE
Volume 2 - Ballistic Missile Defense Organization

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Ballistic Missile Defense Organization

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Ballistic Missile Defense Organization

By Title

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Ballistic Missile Defense Organization
FY 1999 RDT&E Program Exhibit R-1

Appropriation: 0400 D Research Development Test & Eval Defwide Date: FEB 1998

Line No	Program Element Number	Item	Act	Thousands of Dollars FY 1997	FY 1998	FY 1999	Sec
8	0602173C	Support Technologies - Applied Research	2	122,176	109,628	86,866	U
	Applied Research			122,176	109,628	86,866	
29	0603173C	Support Technologies - Advanced Technology	3	248,011	299,788	166,676	U
	Advanced Technology Development			248,011	299,788	166,676	
72	0603861C	Theater High-Altitude Area Defense System - TMD	4	549,579	390,785	497,752	U
73	0603867C	Navy Area	4	157,028			U
74	0603868C	Navy Theater Wide	4	304,171	419,414	190,446	U
75	0603869C	Meads Concepts - Dem/Val	4	58,825	46,144	43,027	U
76	0603870C	Boost Phase Intercept Theater Missile Defense	4	22,755	15,766		U
77	0603871C	National Missile Defense - Dem/Val	4	811,416	941,142	950,473	U
78	0603872C	Joint Theater Missile Defense - Dem/Val	4	493,429	582,000	176,846	U
79	0603873C	Family-of Systems Engineering and Integration	4			96,915	U
80	0603874C	BMD Technical Operations	4			190,147	U
81	0603875C	International Cooperative Programs	4			50,676	U
82	0603876C	Threat and Countermeasures	4			22,113	U
	Demonstration and Validation			2,397,203	2,395,251	2,218,395	
96	0604861C	Theater High-Altitude Area Defense System - TMD	5	66,737		323,942	U
97	0604865C	Patriot PAC-3 Theater Missile Defense Acquisition	5	382,808	198,273	137,265	U

Ballistic Missile Defense Organization
FY 1999 RDT&E Program

Exhibit R-1

Appropriation: 0400 D Research Development Test & Eval Defwide

Date: FEB 1998

Line No	Program Element Number	Item	Act	FY 1997	FY 1998	FY 1999	Sec
				Thousands of Dollars			
98	0604867C	Navy Area Theater Missile Defense - EMD	5	143,343	278,790	245,796	U
		Engineering and Manufacturing Development		592,888	477,063	707,003	
Total		Ballistic Missile Defense Organization		3,360,278	3,281,730	3,178,940	



Applied Research
PE 0602173C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 2 - Applied Research

PE NUMBER AND TITLE: 0602173C Support Technologies - Applied Research

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	122,176	109,628	86,866	79,370	75,295	69,722	67,533	Continuing	Continuing
1651 Innovative Science and Technology (IST)	58,716	60,547	24,024	23,632	26,084	29,478	30,334	Continuing	Continuing
1660 Statutory and Mandated Programs	63,460	49,081	62,842	55,738	49,211	40,244	37,199	Continuing	Continuing

A. Mission Description and Budget Item Justification

To prepare to meet critical future active defense needs, advanced technology programs invest in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the material characteristics and physics for processes that form the basis of technologies that support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMDO develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion, and communication. This project causes and exploits breakthroughs in science that will keep BMD at the foremost edge of what is possible. A primary project goal is to conduct proof-of-concept demonstrations of some of these breakthroughs that will aid in transitioning the technology to development programs.

The Historically Black Colleges and Universities/Minority Institutions (HBCU/MIs) program will be managed under this project, starting in FY99:
The HBCU/MI Program increases and improves the participation of minority colleges and institutions in the BMDO program. It also responds to Section 832 of Public Law (PL) 101-510, which establishes a specific goal for HBCUs and MIs within the overall five percent goal for minority business contracts, and introduces them to BMDO technologies and the particulars of the BMDO procurement process.

Many of today's baseline technologies on BMDO systems like Theater High Altitude Area Defense (THAAD), Patriot Advanced Capability (PAC3), and Ground Based Radar (GBR) are available due to the wise investment in innovative technologies some 10 years ago. Examples include: indium antimonide and mercury cadmium telluride ultra-sensitive infrared detectors; 32-bit radiation hardened Reduced Instruction Set Computer (RISC) processors for image analysis; composite materials for lightweight satellite structures; interferometric fiber-optic gyroscopes for sophisticated guidance and control; and solid-state gallium arsenide transmitter/receivers for BMDO radars. The IST program is the only R&D program in the Defense Department focused specifically on future BMDO technical requirements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research

The Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs for all of BMDO are managed under this budget item. Pursuant to PL 102-564, a two-phased competition for small businesses with innovative technologies is conducted, focusing on BMDO relevant technologies with an emphasis on technologies with dual use potential.

Acquisition Strategy: The IST R&D program receives proposals in response to an annual Broad Agency Announcement (BAA) of research opportunities. Proposals received are competitively judged according to BMD relevance, cost, and capabilities of the offeror. The HBCU/MI program also receives proposals in response to an annual BAA. For the SBIR and STTR programs, strong emphasis is placed on the dual-use nature of the proposed effort. BMDO conducts an annual SBIR/STTR solicitation and competition, and the executing agents award and manage the contracts. BMDO employs government executing agents, called Science and Technology Agents (STAs) from the three services and NASA, with each STA responsible for a specific technical area.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	102,510	101,932	95,488	396,022
Appropriated Value		113,932		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-4,304		
b. Internal Realignments		0		
FY1999 President's Budget	122,176	109,628	86,866	413,258

Change Summary Explanation: . The funding decrease for FY99 (Project 1651) is a result of program realignments from this PE for programs such as AIT, SBL, MSX and Arrow.

C. Other Program Funding Summary ($ in Thousands)

See individual project R-2 exhibits

D. Schedule Profile

See individual project R-2 exhibits

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research	PROJECT 1651

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1651 Innovative Science and Technology (IST)	58,716	60,547	24,024	23,632	26,084	29,478	30,334	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

To prepare to meet critical future active defense needs, advanced technology programs invest in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the material characteristics and physics for processes that form the basis of technologies that support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMD develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion, and communication. This project causes and exploits breakthroughs in science that will keep BMD at the foremost edge of what is possible. A primary project goal is to conduct proof-of-concept demonstrations that will assist in transitioning technology to development programs.

Many of today's baseline technologies on BMDO systems like Theater High Altitude Area Defense (THAAD), Patriot Advanced Capability (PAC3), and Ground Based Radar (GBR) are available due to the wise investment in innovative technologies some ten years ago. Examples include: indium antimonide and mercury cadmium telluride ultra-sensitive infrared detectors; 32-bit radiation hardened Reduced Instruction Set Computer (RISC) processors for image analysis; composite materials for lightweight satellite structures; interferometric fiber-optic gyroscopes for sophisticated guidance and control; and solid-state gallium arsenide transmitter/receivers for BMDO radars. The IST program is the only R&D program in the Defense Department focused specifically on future BMDO technical requirements.

FY 1997 ($ in Thousands):

- $22,304 BM/C3: Tested the fast framing seeker in a real interceptor scenario for its ability to perform passive discrimination. Invested in neural networks for image recognition, optical image processing, multi-sensor tracking. Invested in ultra-stable laser diodes for optical communication; laser satellite communication systems; terahertz communication sources; and spread-spectrum CDMA communications modem.
- $13,166 Materials: Advanced the development of wide band-gap semi-conductors, targeting gallium nitride and silicon carbide, and established a facility specifically for material growth and material characterization research. Began development of advanced optical polymers to be used in 10 wavelength transmitters to achieve 1 terabit/sec transmission rate.
- $4,160 Sensors: Demonstrated Fast Frame Seeker capability against simulated infrared missile targets. Built a flying sensor and processing prototype for pre-launch and boost-phase targets (VIGILANTE); advanced 3-dimensional neural coprocessor; software library for high-speed automatic target recognition.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research PROJECT 1651

- $5,072 Propulsion: Invested in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability, for hypervelocity interceptors. Flight tested the stationary plasma thrusters in space for satellite orbital transfer and orbit plane adjustment.
- $14,014 Power: Completed demonstration of a high temperature superconducting (HTS) generator. Completed development of an advanced power design for a Gallium Nitride Microwave amplifier, and conducted a Gallium Nitride field effect transistor (FET) performance test. Completed design of a optically-cooled GBR power conditioning system. Initiated thermal system design for complete optically-cooled radar system including TR modules, power conditioning system, power generation system, and staged cryogenic cooling system. Completed production of SCARLET array (integration to occur in FY98 under PMA 1270).
- $58,716 Total

FY 1998 ($ in Thousands):

- $16,895 BM/C3: Invest in neural networks for image recognition, optical image processing, multi-sensor tracking. Invest in ultra-stable laser diodes for optical communication; terahertz communication sources; advanced computer architectures; and spread-spectrum CDMA communications modem, as progress warrants. Begin preparation for proof-of-principal tests of Virtual Distributed Hardware-in-the-Loop Testbed (VDHTB). VDHTB Program to transition to PMA 1155 in FY99.
- $20,313 Materials: Invest in wide band-gap semiconductors; polymer-based electronics; digital superconducting electronics; non-volatile random access memory (RAM); and diamond windows and coatings. Demonstrate prototype GaN-based high microwave power amplifier operated at 300 degrees Centigrade.
- $9,670 Sensors: Complete HTS design of integrated cryogenic GBR system prototype. Complete fabrication of 500 kW prototype cryogenic power conditioning system for GBR. Complete thermal system design for prototype system. Demonstrate Fast Frame Seeker capability against simulated infrared cruise missile targets with a gimbaled airborne platform.
- $6,473 Propulsion: Invest in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability. Conduct Express/T-160 Hall effect thruster flight test critical design review.
- $7,196 Power: Invest in advanced switching for radar; high-efficiency solar cells and concentrators; and miniature interceptor guidance technology. Demonstrate a GaN-based high microwave power amplifier, operated at 300 degrees C. Initiate development of an advanced thermal battery for interceptors.
- $60,547 Total

FY 1999 ($ in Thousands):

- $8,489 BMC3: Invest in neural networks for image recognition, optical image processing, multi-sensor tracking and miniature interceptor guidance technology. Invest in ultra-stable laser diodes for optical communication; laser satellite communication systems; terahertz communication sources; advanced computer architectures; and spread-spectrum CDMA communications modem, as progress warrants.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research
	PROJECT 1651

- $4,203 Materials: Continue to invest in wide band-gap semiconductors; polymer-based electronics; digital superconducting electronics; non-volatile random access memory; and diamond windows and coatings, as technical progress and system technology needs warrant.
- $5,209 Sensors: Continue to invest in sensor fusion and advanced neural network image recognition, as technical progress and system technology needs warrant. Perform integrated demonstration of sensor and processing prototype for pre-launch and boost-phase targets (VIGILANTE); demonstrate against ground and airborne TMD targets using multispectral capability.
- $3,290 Propulsion: Continue to invest in high-impulse solid propellants; electric propulsion thrusters; and propellant manufacturability, as technical progress and system technology needs warrant. Conduct Express/T-160 Hall effect thruster flight test.
- $2,833 Power: Continue to invest in a power conditioning system for radar as technical progress and system technology needs warrant. Complete testing of advanced thermal battery for interceptors, phase I, and complete design and start production of phase 2 batteries.
- $24,024 Total

Acquisition Strategy: This R&D program receives proposals in response to an annual Broad Agency Announcement of research opportunities. Proposals received are competitively judged according to BMD relevance, cost, and capabilities of the offeror.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	56,009	50,923	50,094	204,878
Appropriated Value		62,923		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-2,376		
b. Internal Realignments		0		
FY1999 President's Budget	58,716	60,547	24,024	190,043

Change Summary Explanation:

Funding: Resources for this project have been reduced due to revised BMDO FY98-03 program priorities. Funding increase in FY98 reflects congressional plus-up to support wide band-gap materials research.

Schedule: None

Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 2 - Applied Research

PE NUMBER AND TITLE: 0602173C Support Technologies - Applied Research

PROJECT: 1651

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1660 Statutory and Mandated Programs, PE 0602173C	63,460	49,081	62,842	55,738	49,211	40,244	37,199	Cont	Cont
1660 Statutory and Mandated Programs, PE 0603173C	4,617	4,004	0	0	0	0	0	0	14,020
1651 Innovative Science and Technology, PE 0603173C	0	4,811	0	0	0	0	0	0	4,811

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
SKIPPER launch												
RHETT II hardware delivery												
SWARM reticle seeker tracking demo												
Wafer-Scale Associative String Processor Demo												
4 Kbit Nonvolatile Random Access Memory in Silicon Carbide Demo												
ISTEF THAAD tests support							X					
ISTEF Red Tigress III data collection		X										
Integrate 3D chip stack version				X								
VIGILANTE electronics												
Deliver Lasercom System for STRV-2			X									
SWARM Thruster Firing Device			X									
600GHz and 1 THz backward wave oscillator tested				X								
Mass Optical Storage demo			X									
Adv. Signal Processor Prototype delivered				X								
Start preliminary VIGILANTE flights					X							
Integrate first VIGILANTE chip set in lab				X								

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research PROJECT 1651

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
HTS generator demonstration				X								
Gallium Nitride FET performance test						X						
Device characterization of optically-cooled P-HEMP transmit and receive modules for GBR								X				
RHETT II flight test							X					
STRV-2 launch with laser communications demonstration								X				
Non-Linear Optics device demo								X				
SWARM integrated system air table tracking demo								X				
Demonstrate advanced thermal battery for interceptors (phase I)										X		
Express/T-160 launch											X	
VIGILANTE sensor tracking demo using GPS data and simulated cruise missiles											X	
Voxel Cruncher delivered												X
Load THAAD motor case with energetic elastomers propellant and characterize under operational conditions.												X
Laser materials device decision												X
Advanced HWIL testbed demo at NRL												X
Deliver GaN HFET power amplifier (20W MMIC)												X
Test advanced thermal battery for interceptors (phase 2)												X

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research PROJECT 1660

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1660 Statutory and Mandated Programs	63,460	49,081	62,842	55,738	49,211	40,244	37,199	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

To prepare for critical future active defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost phase and terminal missile defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are component technologies with improved performance or reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats. Under this project, the SBIR and STTR programs explore innovative concepts pursuant to PL 102-564 which mandates a two phase competition for small businesses that are developing innovative technologies. Emphasis is placed on dual use technologies for future BMDO needs. Dual use means that the technologies will also be judged on their potential for future private sector investment, both as a vehicle for reducing development time and unit cost of new BMDO technologies as a route to national economic growth through new commercial products.

The HBCU/MI Program increases and improves the participation of minority colleges and institutions in the BMDO program. It also responds to Section 832 of Public Law (PL) 101-510, which establishes a specific goal for HBCUs and MIs within the overall five percent goal for minority business contracts, and introduces them to BMDO technologies and the particulars of the BMDO procurement process. The HBCU/MI program is managed under this project starting in FY99.

Each program will focus, to the maximum extent feasible, on innovative technologies in support of future BMD sensor and interceptor systems. These systems will require processing, sensor, power, propulsion, materials and BMC3 capabilities beyond those currently being developed. An important goal of each program is to identify, develop, and demonstrate innovative technologies which will dramatically improve BMD system performance.

FY 1997 ($ in Thousands):
- $11,326 187 Phase I SBIR and STTR awards to 155 firms.
- $52,134 60 Phase II SBIR and STTR awards to 54 firms.
- $63,460 Total

FY 1998* ($ in Thousands):
- $11,558 200 Phase I SBIR and STTR awards to 150 firms.
- $37,523 45 Phase II SBIR and STTR awards to 60 firms.
- $49,081 Total

* FY98 Funding for this project may vary by as much as ± 15 percent based on revised BMDO program priorities..

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research
	PROJECT 1660

FY 1999 ($ in Thousands):

- $1,364 HBCU/MI program will award approximately 9 contracts.
- $10,900 180 Phase I SBIR and STTR awards to 150 firms
- $50,578 58 Phase II SBIR and STTR awards to 50 firms.
- $62,842 Total

Acquisition Strategy: For SBIR/STTR and HBCU/MI, these competitively awarded programs are in response to annual announcement of research opportunities. For SBIR/STTR, strong emphasis is placed on the dual-use nature of the proposed effort, and proposals received are judged according to technical and commercial potential.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	46,501	51,009	45,394	191,144
Appropriated Value		51,009		
Adjustments to Appropriated Value:				
a. Adjustment to Meet Statutory Requirements		-1,928		
b. Internal Realignments				
FY1999 President's Budget	63,460	49,081	62,842	223,215

Change Summary Explanation:
Funding: None
Schedule: None
Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602173C Support Technologies - Applied Research PROJECT 1660

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1660 Statutory and Mandated Programs, PE 0603173C	4,617	4,004	0	0	0	0	0	0	14,020
1651 Innovative Science and Technology, PE 0602173C	58,716	60,547	24,024	23,632	26,084	29,478	30,334	Cont	Cont
1651 Innovative Science and Technology, PE 0603173C	0	4,811	0	0	0	0	0	0	4,811

The SBIR/STTR program provides leveraging support to the IST program specifically, as well as to all BMDO programs in general.

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
HBCU/MI Solicitation/Review for incremental funding									X			
SBIR/STTR solicitation	X				X				X			



Advanced Technology Development
PE 0603173C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603173C Support Technologies - ATD

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	248,011	299,788	166,676	165,431	163,514	170,079	171,165	Continuing	Continuing
1155 Discrimination	17,800	30,876	20,204	10,504	7,540	4,018	3,435	Continuing	Continuing
1161 Advanced Sensor Technology	32,101	35,712	0	0	0	0	0	TBD	TBD
1264 Atmospheric Interceptor Technology	0	32,986	24,521	24,411	24,328	24,234	24,149	Continuing	Continuing
1270 Adv Interceptor Materials and Systems Tech	69,848	34,933	32,935	43,083	44,380	53,835	55,622	Continuing	Continuing
1360 Directed Energy Program	93,846	122,010	58,813	58,635	58,367	58,181	57,911	Continuing	Continuing
1651 Innovative Science and Technology (IST)	0	4,811	0	0	0	0	0	TBD	TBD
1660 Statutory and Mandated Programs *	4,617	4,004	0	0	0	0	0	TBD	TBD
3352 Modeling & Simulations **	2,502	5,060	0	0	0	0	0	TBD	TBD
4000 Operational Support	27,297	29,396	30,203	28,798	28,899	29,811	30,048	Continuing	Continuing

* FY99-03 funding for this project transferred to PE 0602173C. See that PE/R-2 for FY99-03 activities.

** FY99-03 funding for this project transferred to PE 0603874C. See that PE/R-2 for FY99-03 activities.

A. Mission Description and Budget Item Justification

The BMD supporting technology program develops concepts and components for next generation and product improved ballistic missile defense systems. The responsibility for BMD unique and high leverage technology development rests solely with BMDO within the Department of Defense. In order to meet long range defense guidance priorities, a focused, robust advanced technology development program must be maintained to position the Department to be able to respond to a changing environment and an evolving global missile threat. The program advances the state-of-the-art in those critical functions, components, and subsystems necessary to increase system performance, reliability, maintainability and survivability while reducing acquisition and life cycle cost. This program directly supports those critical related technologies for next generation BMD Systems.

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The BMD technology program is designed to resolve many key R&D issues for future Theater and National Missile Defense systems. BMDO crafts the program as a component of the overall Department technology area plan. The efforts include:

- Development of prediction tools to generate high-confidence target signatures for BMD, a critical adjunct to the evaluation of BMD system performance across the full spectrum of threats and engagement scenarios. Technology development/risk analysis and studies (Project 1155).
- Advanced sensor technology development which is needed to detect, track, discriminate, and intercept advanced (post-2000) BMD threats. This includes target object map generation on board interceptors, the detection and tracking of low observable targets, and other high leverage sensor technologies (Project 1161).
- Development and Integration of the critical technologies for performing hypervelocity hit-to-kill intercepts of TBM's within the atmosphere (Project 1264).
- The Advanced Interceptor Materials and Systems Technology (AIMST) program develops and demonstrates the following for interceptor and space surveillance systems: advanced interceptor sensor processing and power components; multifunctional material and structures; low cost interceptor composite manufacturing processes; and low cost flight test demonstrations. These technologies are critical to reducing the weight and cost of TMD and NMD systems (Project 1270).
- Development of advanced chemical laser systems technologies to demonstrate their integration with a high power laser beam and large optics. (Project 1360)
- Mandated outreach efforts to encourage Small Business Innovation Research, to transition BMD technology to commercial and industrial sectors, and to affirmatively incorporate historically minority and black colleges and universities in development of BMD technology (Project 1660).
- Development, modification and validation of modeling and simulation (M&S) techniques and tools that are critical in assessing the projected, alternative, and demonstrated performance capabilities of Theater Missile Defense (TMD) and National Missile Defense (NMD) systems. (Project 3352).
- Manpower authorizations and the associated costs specifically identified and measured to the performance of these program (Project 4000).

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. Further justification of the Budget Activity code assigned to each Program Element is contained within the Brief Description of Element section of each Program Element Summary.

FY 1996 Accomplishments: See individual R-2 project summaries.
FY 1997 Accomplishments: See individual R-2 project summaries.
FY 1998 Plans: See individual R-2 project summaries.
FY 1999 Plans: See individual R-2 project summaries.

Acquisition Strategy: See individual R-2 project summaries.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	251,294	147,557	144,902	674,364

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	FY 1997	FY 1998	FY 1999	Total Cost
Appropriated Value		311,557		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-11,769		
b. Internal Realignments				
FY1999 President's Budget	248,011	299,788	166,676	843.790

Change Summary Explanation:

Funding: Over the past few years, in compliance with congressional direction and in consonance with the Bottom-Up Review findings, the Department has significantly restructured the follow-on supporting technology program for ballistic missile defense. Today, BMDO management is highly focused on those technologies that directly support TMD and NMD systems developments, or hold significant promise for advanced missile defense systems. In instances where those programs have significant collateral application to other military missions, technical information is shared with the interested military department. The ongoing advanced technology program supports DoD's long-term commitment to continue, at a stable level, critical research on technologies that build on work to date in order to prepare for more capable and affordable active ballistic missile defense systems. This submission incorporated minor realignments of work effort between sensor and interceptor technologies to take advantage of project synergy's. Additionally, the directed energy program continues through the FYDP to provide the technological base advances essential to prepare robust responsive threat options. The funding increase for FY99 is a result of program realignments into this PE for programs such as AIT, SBL, MSX and Arrow.

Schedule: See individual R-2s.
Technical: See individual R-2s.

C. Other Program Funding Summary ($ in Thousands)

See Individual Project R-2 Exhibits

D. Schedule Profile

See Individual Project R-2 Exhibits

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1155 Discrimination	17,800	30,876	20,204	10,504	7,540	4,018	3,435	Continuing	Continuing

A. Mission Description and Budget Item Justification

To prepare for critical future missile defense needs, advanced technology programs will conduct a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost, midcourse, and terminal phase missile defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are subsystems with improved performance or reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.

This program provides the U.S. with the data and predictive tools to generate high confidence target signatures for ballistic missile defenses (BMD). This is a critical adjunct to the evaluation of BMD system performance across the full spectrum of threats and engagement scenarios. This program provides data collection sensors and instruments for use on live-fire missions and provides analysis of the resulting test data. This program provides predictive models of target signatures in both Radar and Infrared spectrums. This program evaluates and develops algorithms for the critical functions of discrimination, target handover, and aimpoint selection. This program provides for data storage and retrieval of all BMDO sponsored tests per statutory requirements.

The Midcourse Space Experiment (MSX) Analysis is the work to establish the limits of the ability of Long Wavelength Infrared (LWIR), visible, and ultraviolet sensors to acquire, track, and discriminate targets and decoys against the full range of earth and celestial backgrounds. This data was collected during the operation of the Space Infrared Imaging Telescope (SPIRIT 3). Analysis of this data will establish confidence in predicting LWIR and visible sensor performance through the entire midcourse phase of the BMD mission. Specific applications include current and future elements of the NMD program, particularly the Space Based Infrared System (SBIRS). The results of this analysis will also validate key sensor technologies and establish their limits of performance in a realistic environment.

MSX Operations is the program to expand and develop the database for target signatures and background data collected by MSX observations. This effort will include planning, collection, and analysis of target signature data, in cooperation with BMDO, other DoD, and international programs, to validate emerging modeling, simulation, sensing, and tracking techniques. This program supports the development of kill assessment, sensor data fusion, and liquid rocket plume characterization. MSX operations will also include participation in the Space Based Space Surveillance Operations (SBSSO) Advanced Concept Technology Demonstrator (ACTD) as a pathfinder for incorporating satellites into the space surveillance network.

Data Collection is the program to provide effective and robust threat signature collection for ballistic missile defense programs. This program analyzes existing and emerging requirements for signature data collection capabilities. This program provides mission planning and funding for high value BMDO signature collection activities. These activities provide for the maximum use of existing high altitude data collection aircraft to collect ballistic threat signatures in all phases of flight. Signature data dissemination and modeling tie in with higher level simulations will be developed to meet TMD/NMD requirements. Evaluation, development, and

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employment of several types of potential data collection sensors will be conducted per the direction of OSD. This program provides exploitation of new signatures provided by emerging sensing technologies.

Virtual Distributed Hardware-in-the-Loop Test Bed (VDHTB). The purpose of the VDHTB is to facilitate the infusion into BMDO programs of newly available, BMDO developed, real-time geographically-distributed, computing technologies that have the potential to provide major improvements for BMDO's Battle Management, Command, Control, Communications, and Computers (BMC4) efforts as well as for simulation and HWIL testing capabilities

Technical Analysis is the program to provide BMDO with the specialized support required to resolve advanced technology development and technical operations issues, including trade studies of the cost, schedule, and technical risks of alternative program investment strategies. This includes special studies and reviews involving long-range program planning and technical and programmatic issues such as methods to maximize the insertion of cost-effective, performance-enhancing advanced technologies into future NMD/TMD systems, and the timely and accurate assessment of the present and future technology program across BMDO. This program supports BMDO in all aspects of battlespace environment discrimination analysis including scientific studies and analysis in optical and radar areas.

The goal of the Scorpius program is to develop a low-cost expendable launch vehicle to support testing and deployment of a future space based laser system. This program will provide an engineering proof-of-concept demonstration using a sub-orbital liquid propellant rocket. The overall objective will be to develop and demonstrate significant cost reductions in propulsion, composite tanks and structures, avionics, vehicle control, manufacturing and operations for expendable launch vehicles.

FY 1997 ($ in Thousands):

–	$3,492	Technical Analysis: Provided BMDO with the specialized support required to resolve development and deployment issues, including trade studies of the cost, schedule, and technical risks of alternative deployment readiness options. Provided special studies and reviews involving long-range program planning, technical and programmatic issues such as methods to maximize NMD deployment by leveraging development efforts of the TMD program. Supported BMDO in all aspects of battlespace environment discrimination issues including scientific studies and analysis in optical and radar areas of the spectrum.
–	$5,347	MSX Analysis / Space-based Phenomenology Program Database Development: Collected and analyzed multispectral (infrared, ultraviolet and visible) background data from the MSX to support SBIRS and other users. Collected and analyzed multispectral signature data on ballistic missiles during boost, mid-course, and terminal phases of flight, as well as high altitude aircraft.
–	$8,961	Data Collection: Analyzed existing and emerging requirements for TMD signature data collection capabilities. Performed mission planning for all BMDO signature collection activities. Performed signature collection missions using existing high altitude aircraft. Developed approach to tie signature data and modeling to higher level simulations.
–	$17,800	Total

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FY 1998 ($ in Thousands):

- $5,791 Technical Analysis: Provide BMDO with the specialized support required to determine alternative technology development strategies for meeting future NMD and TMD requirements. This includes trade studies of the cost, schedule, and technical risks of alternative technology investment options. Provide special studies and reviews involving long-range program planning, technical and programmatic issues such as methods to maximize NMD deployment by leveraging development efforts of the TMD program. Support BMDO in all aspects of battlespace environment discrimination issues including scientific studies and analysis in optical and radar areas of the spectrum.
- $4,231 MSX Analysis: Analyze target and background data from the MSX to support Space Based Infrared System (SBIRS) and other users. Transfer promising Long Wavelength Infrared (LWIR) and visible sensor/processor technologies and algorithms. MSX analysis will validate key sensor, modeling and tracking technologies.
- $11,122 Data Collection: Continue analysis of existing and emerging requirements for signature data collection capabilities. Demonstrate signature data collection capabilities at the laboratory level. Acquire mission capable signature data collectors to meet requirements. Perform mission planning for all BMDO signature collection activities. Perform signature data collection missions using existing signature data collection aircraft. Implement approach to tie signature data and modeling to higher level simulations.
- $4,921 MSX Operations: Collect and analyze background and target data in cooperation with BMDO, other DoD, and international programs, to validate emerging modeling, simulation, sensing, and tracking techniques.. Use data and analysis information to support sensor data fusion, model validation, kill assessment, and plume characterization. MSX will also participate with Air Force Space Command in ACTD for Space Based Space Surveillance Operations as a pathfinder for the incorporation of satellites into the Space Surveillance Network.
- $4,811 Scorpius: Conduct flight test of the Sounding Rocket-1 fabricated in FY97. Conduct engine test of 20,000 lb thrust engine. Continue design of 80,000 lb and 320,000 lb thrust engines.
- $30,876 Total

FY 1999 ($ in Thousands):

- $4,755 Technical Analysis: Provide BMDO with the specialized support required to determine alternative technology development strategies for meeting future NMD and TMD requirements. This includes trade studies of the cost, schedule, and technical risks of alternative technology investment options. Provide special studies and reviews involving long-range program planning, technical and programmatic issues such as methods to maximize NMD deployment by leveraging development efforts of the TMD program. Support BMDO in all aspects of battlespace environment discrimination issues including scientific studies and analysis in optical and radar areas of the spectrum.
- $6,227 VDHTB: Start proof of principal test demonstrating newly available, BMDO developed, real-time, geographically-distributed, computing technologies that have the potential to provide major improvements for BMDO's BMC4 efforts as well as for simulation and HWIL testing capabilities. The VDHTB's purpose is to facilitate the infusion of these computing technologies into BMDO programs.
- $7,222 MSX Analysis: Analyze target and background data from the MSX in support of SBIRS and emerging BMDO technologies. Continue transferring promising LWIR and visible sensor/processor technologies and algorithms.

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– $2,000 MSX Operations: Collect and analyze background and target data in cooperation with BMDO, other DoD, and international programs, to validate emerging modeling, simulation, sensing, and tracking techniques. Use visible and ultraviolet sensor to explore applications for BMD tracking, sensor development, and modeling. MSX will also participate with Air Force Space Command in the ACTD for Space Based Space Surveillance Operations as a pathfinder for the incorporation of satellites into the space surveillance network.

– $20,204 Total

Acquisition Strategy: This project funds its efforts through executing agents in the Air Force, Army, Navy and BMDO via existing contracts.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	18,309	26,740	26,205	73,664
Appropriated Value		36,740		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-1,244		
b. Internal Realignments		-4,620		
FY1999 President's Budget	17,800	30,876	20,204	71,290

Change Summary Explanation:

Funding: Reductions in FY98 and FY99 due to revised internal BMDO advanced technology program priorities. Funding priorities have eliminated Data Collection project in FY 99. MSX Analysis is under funded in FY98 and funding for MSX Operations in FY99 and beyond has been removed. Funding increase in FY98 reflects Congressional plus-ups for MSX Operations and Scorpius. Execution of and funding for the Scorpius program was transferred from Project 1360 to Project 1155 in FY98.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 Discrimination Program, PE 0603871C	19,587	18,164	0	0	0	0	0	0	56,492
1155 Discrimination Program, PE 0603872C	30,919	31.939	0	0	0	0	0	0	99,766
1155 Discrimination Program, PE 0603874C	0	0	35,495	25,373	27,711	29,684	31,399	Cont	Cont

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Perform MSX data analysis	X	X	X	X	X	X	X	X	X	X	X	X
Collect MSX target and background data					X	X	X	X	X	X	X	X
Analyze Signature Collection Rqmts	X	X	X	X	X	X	X	X	X	X	X	X
Perform Data Collection Missions	X	X	X	X	X	X	X	X	X	X	X	X
Upgrade Signature Data Collection						X	X	X				
Perform Signature Collection Demos			X	X			X	X				
Perform SBSSO ACTD				X	X	X	X	X	X	X	X	X
Scorpius Sounding Rocket-1 launch						X						
Scorpius 20,000 lb engine test								X				

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1161 Advanced Sensor Technology	32,101	35,712	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

To prepare for critical future active defense needs, advanced technology programs will conduct a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost, midcourse, and terminal phase missile defense interceptors, and advanced target sensors, as well as advances in innovative science. The objectives of these investments are subsystems with improved performance, reduced costs for acquisition programs, and technical solution options to counter advanced and unpredicted threats.

The purpose of ASTP is to provide the sensor technology needed to detect, track, and discriminate advanced (post-2000) BMD threats. The technologies for ASTP were chosen through a technology requirements analysis driven by BMD missions, threats, system requirements, and schedules. Care was taken to avoid duplication with other programs both within and external to BMDO. Starting in FY1998, ASTP realigned interceptor-related technology efforts under Project 1270 to correspond with their discriminating interceptor technology focus.

The three Services and BMDO are developing technologies in their Project Reliance areas of expertise. The Air Force developed passive sensor technology, the Army - ladar technology. These technologies have leveraged to support DITP or were suspended.

Real-time data fusion is a central focus of ASTP. It is identified by the technical requirements analysis as the best solution to the difficult signal processing problem. High-speed data fusion algorithms are under development by BMDO for this critical need.

Laboratory and field demonstrations of ASTP technologies are being conducted throughout the program, starting with advanced focal plane imaging demonstrations conducted at White Sands Missile Range, NM (WSMR) in FY95. Larger experiments permitted fusion of radar, infrared, and ladar data beginning in FY96 and FY97, when scaled rocket flights provided initial collocated multi-sensor data for benchmarking of tracking algorithms. FY98 funding will be used to document progress to date and complete demonstrations in progress. Technology being developed that is applicable to the Discriminating Interceptor Technology Program (DITP) will be transferred to PMA 1270.

The technologies under development in ASTP are:

Multiple Quantum Well (MQW) Focal Plane Arrays (FPA). MQW FPAs have made rapid progress in the past three years, and are now available in 256x256 format with quantum efficiency approaching 30 percent. This technology is important due to its potential for high sensitivity, low noise, high uniformity imaging and low production cost providing the IR detection and discrimination capability required by all BMDO exo-atmospheric systems.

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Simultaneous Multi-Color FPAs. FPAs capable of simultaneously measuring two or more Infrared (IR) wavebands will simplify sensor design for both surveillance and interceptor seekers. The result will be highly sensitive, discriminating sensors which are more reliable, lighter, and less costly than currently available.

Smart FPAs. Pre-processing sensor data on or near the FPA greatly improves processing throughout. This provides the overall processing speed needed for real-time data fusion for accomplishing multiple target tracking, discrimination, and tracking low-observable targets in clutter.

Imaging Ladar. Miniature Laser Radar (ladar) integrated with passive sensors will allow precise tracking and discrimination of BMD targets. Ladar capable of range-doppler and 3-dimensional imaging are under development and will continue under DITP funding as leveraged technology. The ladar technology is also consistent with interceptor technology requirements.

Real Time Data Fusion Algorithms. Techniques for combining (fusing) data for tracking multiple targets, discrimination, and sensor optimization are under development. The algorithms are critically needed as principal elements of the fusion processor. They are the central focus of the ASTP data fusion effort and have the flexibility to be employed by any system requiring high speed high density data fusion.

Russian American Cooperative Programs:

- The Russian American Observation Satellites (RAMOS) is an innovative American-Russian spaced based remote sensor research and development program addressing the ballistic missile defense, national security, and environmental technology issues. This program engages Russian early warning satellite developer in the joint definition and execution of space experiments. Near term experiments have focused on planning and executing nearly simultaneous observations of Earth features using US and Russian satellites. Future near-term experiments include the development of US and Russian instruments for Flying Infrared Signatures Technology Aircraft (FISTA) proof-of-concept measurements. This program was moved to PE 0603875C in FY99, see the R-2 Exhibit for that PE for FY99-03 funding. This program investigates options for future cooperation in the joint definition and execution of space experiments to address stereoscopic theater missile detection and tracking below and above the horizon, as well as mutual environmental concerns.
- The APEX is an upper atmospheric joint research project with Russian scientist, using Russian launch vehicles and US/Russian on-board sensor packages, Russian ground optical/radar sites, and US MSX satellite to monitor experiments and collect data.

Down Under early Warning Experiment (DUNDEE). DUNDEE is a cooperative advanced BMD sensor and BMC/3 technology research demonstration with the Australian Defense Science Technology Organization (DSTO). Objectives are to perform research, demonstration, and post mission data reduction using the Australian Jindalee Over-the-Horizon Radar to detect TBM targets. Specific objectives include: wide area, timely launch detection; target identification using plume doppler signature; and trajectory association with satellite detection reports.

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FY 1997 ($ in Thousands):

–	$6,661	Began laboratory, ground, and chamber demonstrations of components, began planning for flight demonstrations, began system performance simulations, conducted system level system design review (SDR). Compared different Gallium Arsenide based structures, such as transistors, to determine optimum device structure for T/R modules and components. Developed and improved interceptor communications technologies, including conformal antenna array designs.
–	$5,527	Continued development, integration, and testing of passive IR components that are candidates for multi-sensor flight demonstration; demonstrated simultaneous 256x256 2-color MQW array at Army Missile Optical Range (AMOR), and delivered on-FPA electronics.
–	$7,548	Continued integration of radar sensor for multi-sensor flight demonstration.
–	$2,293	Developed and tested fusion processing algorithms for tracking and discrimination from an airborne platform.
–	$8,822	Executed RAMOS near-term space observations over Russia and Antarctica. Exchanged data and performed data analysis, and reconstructed 3-dimensional scenes. Designed and built proof-of-concept hyperspectral polarmeter and 3-dimensional lidar (US), and imaging radiometer (Russia) for FY 98 FISTA aircraft experiments. Investigate options to meet space/high altitude science objectives, performed engineering trade studies to determine the cost of various experimental options.
–	$1,250	Conducted DUNDEE design trades and executed acquisition and assembly of 4 sounding rocket targets. Provided ground assembly, testing, launcher acquisition, remote site transportation, in-theater launch support, and overall target management for the DUNDEE cooperative demonstration. Executed experiment in Anna Plains, Australia, in September.
–	$32,101	Total

FY 1998* ($ in Thousands):

–	$12,256	Conducts joint US/Russian Concept Design Review (CoDR) to validate defense and environmental science objectives and evaluate space experiment objectives. Conducts proof-of-concept sensor demonstration measurements aboard FISTA aircraft. Develops system modeling and simulation concept jointly with the Russians. Continues functional and performance requirement definition process.
–	$7,951	Begin experimental planning, finalize experiment objectives and criteria. Specify experiment design, electrical, mechanical, and environmental interfaces between US and Russian components and systems. Begin fabrication of components to be used for flight tests.
–	$15,505	Perform laboratory, ground, and chamber demonstrations of integrated components that support DITP; document test results to date. Funding transferred to PMA 1270 to support leveraged technology for DITP.
–	$35,712	Total

FY 1999 ($ in Thousands):

–	$0	Funding for RAMOS and APEX in FY99 and beyond has been transferred to Budget Activity 4, Demonstration/Validation in Program Element 0603875C.
–	$0	Total

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Acquisition Strategy: ASTP is a Tri-Service/BMDO program. The executing agents will use existing contracts, and in-house resources to perform this program. The Air Force is developing passive IR technology (multi-color FPAs and on-FPA processing) and is responsible for passive sensor technology development, integration, and testing. The Army is responsible for ladar technology development, integration, and testing. BMDO is developing fusion processor technology and algorithms and is responsible for performing platform integration. BMDO will initiate contracts to perform these efforts. Cooperation with on-going programs will be maximized to leverage funding. Due to funding cuts in FY99 and beyond, ASTP will be terminated at the end of FY98. FY98 funds will be used to continue technology being leveraged by DITP, and to bring the remainder of the technology efforts to a logical conclusion.

The US prime contractor for RAMOS is the Space Dynamics Laboratory of Utah State University, a designated University Affiliated Research Center for space sensors. SDL has a prime/subcontractor relationship with the Russians. The Russian lead is Rosoorouzhenie, a state arms import/export agency, with technical execution done by NPO Cometa and Astrophysica.

RAMOS is a cooperative experiment program developed to engage the Russians in early warning and theater missile defense relater technologies. Although possessing moderately strong technical rationale and high level political support, this program has relied on Congressional plus-ups for execution in FYs 97 and 98. The January 1998 Design Concept Review will result in an FY98 decision by OSD/BMDO on how to proceed to a space experiment. This program was moved to PE 0603875C in FY99, see the R-2 Exhibit for that PE for FY99-03 funding

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	32,797	24,527	22,743	99,393
Appropriated Value		45,527		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-1,403		
b. Internal Realignments		-8,412		
FY1999 President's Budget	32,101	35,712	0	85,862

Change Summary Explanation:

Funding: Funding increases in the FYs beyond 96 reflects Congressional plus-ups of the RAMOS and APEX programs. The sharp decrease in total dollars in the projected budget for FY99 reflects the termination of the ASTP effort and the leverage of applicable technologies to DITP. Funding for RAMOS and APEX in FY99 and beyond has been transferred to Budget Activity 4, Demonstration/Validation in Program Element 0603875C.

Schedule: None

Technical: Sensor and interceptor technology efforts have been realigned within Projects 1161 and 1270, respectively, to better reflect the technologies' principal applications.

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C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1270 Applied Interceptor Materials and Systems Technology, PE 0603173C	69,848	34,422	32,935	43,083	44,380	53,835	55,622	Cont	Cont
1270 Applied Interceptor Materials and Systems Technology, PE 0603872C	0	0	0	0	0	0	0	0	9,137
1360 Directed Energy Programs, PE 0603173C	93,846	122,010	58,813	58,635	58,367	58,181	57,911	Cont	Cont
2400 NMD Program, PE 0603871C	811,416	945,984	962,703	864,435	664,930	359,444	313,406	Cont	Cont
3360 Test Resources, PE 0603872C	36,968	58,831	13,788	13,391	13,334	13,283	13,238	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
ASTP												
Sequential 2-color 256x256 MQW Imagery Demonstration												
Eyesafe Ladar Pump Demo												
Simultaneous 2-color 256x256 MQW Imagery Demonstration			X									
Demonstrate FED smart windowing			X									
System-level PDR; interface requirements defined				X								
On-FPA Electronics Delivery					X							
Fabricate FED 128x128 on-FPA processing electronics						X						
Passive-to-active sensor handover demo at AMOR						X						
RAMOS												
Define Terms of Agreement Contract Signed			X									
Russian Federation Presidential Approval				X		X						

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Joint U.S./Russian Obs. (MSX/MSTI/RSESURS-1)	X		X									
Polarization Measurements - FISTA			X	X		X		X				
Concept Design Review						X						
Proof of Concept Sensors - FISTA			X	X								
Proof of Concept Demonstrations							X	X				
APEX												
Contract ATP						X						
Payload Delivery to Alaska								X				

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1264 Atmospheric Interceptor Technology	0	32,986	24,521	24,411	24,328	24,234	24,149	Continuing	Continuing

* Funding for this project for FY98-03 was transferred from project 1270. See that project in this document for FY96-97 activities.

A. **Mission Description and Budget Item Justification**

To prepare for critical future defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities at affordable cost with lower technical and schedule risks for terminal and boost phase missile defense interceptors. The objectives of these investments are demonstrated component and systems technologies with improved performance and reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.

The AIT program will develop, integrate and demonstrate the critical technologies for performing hypervelocity hit-to-kill intercepts of Theater Ballistic Missiles (TBMs) within the atmosphere. The demonstrations will validate the solution to critical interceptor technologies and will provide: (1) new capabilities with reduced costs/risks compared to current interceptor weapons systems, and enhancements to other interceptors under development; (2) reduction of technical risks and costs in support of acquisition programs through direct technology insertions; and (3) technical solutions to provide theater defense interceptor capabilities for contingencies not currently addressed by the TMD system programs. The program uses existing contracts and technologies currently under development to reduce schedule and cost, and will be planned and conducted with BMDO, Air Force, Navy, and Army elements to make maximum use of existing Service infrastructures.

The AIT program consists of three major programs: (1) Technology Testbed Integration, (2) Component and Subsystem Technologies, and (5) Component and Subsystem Technology Development. Note that tasks (3) and (4) have been subsumed into the other three.

(1) Technology Testbed Integration: This task consists of all activities associated with design, integration, fabrication, and ground test of lightweight endoatmospheric technology testbeds that incorporate the products of AIT component and subsystem technology developments. The task includes the procurement actions needed to obtain the prime technology testbed integration contractor, a preliminary concept design phase, a detailed design and subsystem integration phase, followed by a testbed vehicle fabrication and vehicle ground test phase. U. S. Army Space and Missile Defense Command is the executing agent (EA) for this task.

(2) Component and Subsystem Technologies: This task consists of the development, integration, and test of AIT component and subsystem technologies. These technologies include IR and RF seeker components and subsystems, advanced target acquisition /tracking algorithms, non-toxic or reduced toxicity lightweight propulsive divert and attitude control systems (DACS) and components, avionics, processors, guidance algorithms, software methodologies, and lightweight structures for application in lightweight endoatmospheric kill vehicles. The task includes the completion of strapdown IR seeker technology development and demonstration conducted under PMA 1270.06 through hardware-in-the-loop testing or the prototype seeker. The EA for the bulk of this task is the U. S. Army Space and Missile Defense Command. The EA for the RF seeker technologies portion is the U. S. Naval Air Warfare Center, Weapons Division (China Lake).

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(5) Component and Subsystem Technology Development: This task consists of the continued aero-optics testing of the internally cooled window concept, jet interaction radiance and aerodynamic testing at the Aero-Optic Evaluation Center (AOEC), and the planning, conduct, and evaluation of developmental (component/subsystem) and vehicle flight tests of the endoatmospheric technology testbeds developed within this project. The task includes the design, integration, fabrication, and ground check-out of experimental packages and flight test vehicles. Testing includes intercept flight tests with full-up testbeds to demonstrate critical technologies and their interactions in hit-to-kill intercepts of ballistic missile targets in realistic scenarios. U. S. Army Space and Missile Defense Command is the executing agent (EA) for this task.

FY 1997 ($ in Thousands):

–	$0	Project previously within Project 1270, Task 6.
–	$0	Total

FY 1998 ($ in Thousands):

–	$6,100	Continue solid DACS component development and test
–	$6,800	Prototype strap-down IR seeker development
–	$1,000	Seeker hardware-in-the-loop test
–	$3,100	Breadboard avionics development
–	$1,700	Aero-optical shock tunnel test
–	$1,600	Jet interaction testing
–	$1,600	Jet irradiance testing
–	$3,100	Simulation software development
–	$1,000	Lithium oxyhalide battery development
–	$5,386	Initiate interceptor testbed preliminary design
–	$1,600	Component flight test
–	$32,986	Total

FY 1999 ($ in Thousands):

–	$3,300	Flightweight solid DACS ground test
–	$10,321	Continue interceptor testbed preliminary design
–	$3,300	Advanced IR seeker brassboard demo
–	$3,300	Complete avionics brassboard
–	$2,200	Complete integrated interceptor simulation

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- $2,100 Component flight test
- $24,521 Total

Acquisition Strategy: The AIT program plan will consist of development and validation of endoatmospheric kill vehicle technologies for potential use in advanced TMD systems, such as advanced PAC-3, NADS, THAAD, MEADS and UAV/BPI; options for the design, fabrication, and test of the interceptor testbeds; options for KKV/booster integration and flight tests. USASSDC will provide technical and contract management of the AIT prime contract. On-going, competitively-awarded, CPFF contracts for the interceptor technologies within the AIT program will continue through the completion of ground testing and potential flight tests.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
Appropriated Value		30,000		
Adjustments to Appropriated Value				
a. General Reductions (FFRDC, Inflation, etc.)		-1,133		
b. Internal Realignments		+4,119		
FY1999 President's Budget	0	32,986	24,521	57,507

Change Summary Explanation:

Funding: For FY 1997 this Project was funded within Project 1270, Task 6. For FY1998, recognizing the importance of this project and the support demonstrated by Congress, a new Project (1264) was created. Additionally, the budget submission has been increased to $24,521M for FY1999.

Schedule: The schedule for this Project has been substantially advanced due to the $30M FY1998 Congressional plus-up and the substantial increase in the FY1999 budget submission.

Technical: Technical requirements for this project have been re-evaluated to better align them with the future of missile defense. The requirements have focused on producing technologies required for advanced missile defense interceptors which counter advanced threats within the atmosphere, thereby making missile defense systems more robust while also reducing interceptor cost and improving producibility.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1161 Advanced Sensor Technology, PE 0603173C	32,101	35,712	0	0	0	0	0	0	82,428

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	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1161 Advanced Sensor Technology, PE 0603875C	0	0	12,752	0	0	0	0	TBD	TBD
1270 Applied Interceptor Materials and Systems Technology, PE 0603173C	69,848	34,422	32,935	43,083	44,380	53,835	55,622	Cont	Cont
U.S. Air Force Rocket System Launch Program, PE 65860F, Project 1023	32,165	28,013	8,023	8,255	8,360	8,522	8,729	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Aero-optical shock tunnel tests (window #2)					X							
Seeker initial HWIL tests						X						
Critical component technology BAA contract awards						X						
Final prototype seeker development and test							X					
Jet interaction testing							X					
Seeker line-of-sight stabilization demo							X					
Award AIT Testbed Contract								X				
Jet irradiance testing								X				
Flightweight divert valve test								X				
DACS divert pintle/throat hot fire test								X				
Tracker algorithm demo								X				
DACS integrated composite tank burst test									X			
DACS hot gas regulator test									X			
Deliver 6 lithium/oxyhalide batteries										X		
Flightweight solid DACS test										X		
IMU breadboard builds											X	
Fully integrated simulation tool											X	
Component Flight Test #1												X
Advanced seeker brassboard demo												X

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Brassboard integrated avionics unit demo												X

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1270 Adv Interceptor Materials and Systems Tech	69,848	34,933	32,935	43,083	44,380	53,835	55,622	Continuing	Continuing

A. Mission Description and Budget Item Justification

To prepare for critical future defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities at affordable cost with lower technical and schedule risks for boost phase and terminal missile defense interceptors, advanced target sensors and future space surveillance and defense systems. The objectives of these investments are component and systems technologies with improved performance and reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.

The Advanced Interceptor Materials and Systems Technology (AIMST) program develops and demonstrates the following for interceptor and space surveillance systems: advanced interceptor sensor processing and power components; multi-functional materials and structures; low cost interceptor composite manufacturing processes; and low cost flight test demonstrations. These technologies are critical to the deployment of effective, affordable TMD and NMD systems.

The near-term AIMST projects are planned and executed through direct interchange with System Program Offices (SPOs) and prime contractors responsible for fielding current NMD Technology Readiness and TMD systems hardware. The execution of this comprehensive technology program is proceeding at a restrained pace. Efforts on near-term technologies that will increase interceptor and sensor performance while lowering deployment costs are progressing based on available funding.

Through FY97, the AIMST program consisted of six major programs: (1) Discriminator Interceptor Technology, (2) Materials and Structures, (3) Power Technology, (4) Endo Atmospheric Flight Experiment (EFEX), (5) the Space Technology Research Vehicle (STRV), and (6) the Atmospheric Interceptor Technology (AIT) programs. Starting in FY98 execution of the Atmospheric Interceptor Technology program was transferred to Project 1264 and the Scorpius program was transferred from Project 1360 to this project.

(1) Discriminating Interceptor Technology Program (DITP): The DITP develops subsystems necessary to achieve long range threat acquisition and tracking, accurate homing guidance, robust discrimination, and aimpoint selection for autonomous hit-to-kill interceptors. Multicolor passive infrared sensors, laser radars (ladars) fusion processors, and algorithms are being developed, designed, built, and tested. Emphasis is placed on increasing active sensor output power, miniaturization, and ladar waveform generation to support on-board target imaging. The goal of the DITP is flight demonstrations of the integrated sensor suite, with its data fusion processor and associated discrimination/data fusion algorithms, to demonstrate the performance and readiness of the advanced subsystems to support future upgrades to NMD and TMD interceptors.

(2) The Materials and Structures Program: The materials and structures program develops and demonstrates: advanced, low cost to manufacture, multifunctional, composite structural components; adaptive and passive vibration isolation and suppression systems; optical materials and baffle specialty components; and low

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temperature superconductor long-wave infrared (LWIR) sensor electronics. This program also evaluates new high temperature, composite materials for use in manufacturing propulsion components such as ceramic hot gas lines, combustion chambers, nozzles, and exit cones. Many projects executed under the Materials and Structures Task, which includes the EFEX and STRV programs, rely on cooperative funding from other agencies (AF, Army, DARPA, NASA) or international partners (UK, Japan). In some cases, cooperative funding represents a substantial portion of total project resources. Reductions in current or future cooperative funding will adversely impact planned goals and schedules.

(3) Power Technology Program: The power program develops concentrator solar arrays (SCARLET) ; electric generators, thermal management components, and power conditioning for Ground-Based Radar (GBR); and batteries for TMD and NMD interceptors. The technologies will improve system performance in terms of reducing recurring costs, lowering mass and increasing efficiency.

(4) Endo Atmospheric Flight Experiment (EFEX) Program: This multi-flight test program will use existing sounding rockets to provide the hypersonic flight environment to validate advanced interceptor technologies. Lightweight, ultrastiff, high temperature, multi-functional structures, optical and structural thermal control concepts, super-tough optical windows and erosion resistant coatings, emergent processing and guidance schemes, miniature inertial systems, advanced shroud concepts, propulsion systems, and dual mode seekers and aperture will be tested. The flight test results will be correlated with aerothermal-mechanical test results from ground-based hypersonic and shock tube facilities in the 3 to 4 km/sec velocity and 20 km to 45 km altitude range. Subsequent tests will emphasize high-G maneuverable flight profiles.

(5) Space Technology Research Vehicle Program (STRV-1c/d, STRV-2 and STRV-3): The STRV-2 Experiment Module will consist of an advanced composite structure supporting the following 6 primary payloads: 1) a UK provided Mid-Wavelength Infrared (MWIR) experiment; 2) the Vibration Isolation Suppression System (VISS); 3) the Space Active Modular Materials Experiment System (SAMMES); 4) the Electronic Test Bed (ETB); 5) the Laser Communications Experiment (Lasercom); and 6) the micro-meteoroid & debris (MM&D) experiment. The low outgassing, high stiffness and high strength composite structure is part of the overall experiment providing critical validation for this technology. Multiple sensors will be used to measure local contamination from all sources, including the composite structures. MWIR background/clutter data will be obtained using filters specified by the Space Based Infrared System (SBIRS Low) SPO. Data on the space environment at SBIRS Low mission altitudes and its effects on materials, components and systems will be obtained. A one year mission is planned. An effort has been initiated to conduct follow-on cooperative space experiments with the UK using micro satellites based on the recent US/UK STRV 1a/b program. These UK-provided micro satellites (STRV 1c/d) have a nominal launch planned for Fiscal Year 1999. The experiments to be flown on STRV 1c/d include a Quantum Well Infrared Photometer (QWIP) sensor, an electronics testbed, and a multi-functional composite structure. The Space Technology Research Vehicle-3 (STRV-3) will be a US-led multi-agency, multi-national (UK, US allies) cooperative space experiment effort. The program is in the preliminary discussion stage.

(6) Atmospheric Interceptor Technology (AIT) Program: The AIT program will develop, integrate and demonstrate the critical technologies for performing hypersonic hit-to-kill intercepts of Theater Ballistic Missiles (TBMs) within the atmosphere. The demonstrations will validate the solution to critical Kinetic Kill Vehicle (KKV) technologies and will provide: (1) new capabilities with reduced costs/risks compared to current interceptor weapons systems, and enhancements to other interceptors under development; (2) reduction of technical risks and costs in support of acquisition programs through direct technology insertions; and (3) technical solutions to provide theater defense interceptor capabilities for contingencies not currently addressed by the TMD system programs. The program uses existing contracts and

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technologies currently under development to reduce schedule and cost, and will be planned and conducted with BMDO, Air Force, Navy, and Army elements to make maximum use of existing Service infrastructures. The AIT project will participate in the UAV/BPI Studies (PMA 1294) and the Navy Theater Wide requirements studies.

FY 1997 ($ in Thousands):

- $7,049 Space Surveillance System Support: Continued data reduction of ACTEX-1 space experiment. Delivered SAMMES for STRV-2. Continued integration of STRV-2 flight experiments. Continued STRV-1c/d Program. Continued fabrication of flight qualified, multi-kilowatt SCARLET concentrator solar array for FY98 flight demonstration.
- $20,616 Interceptor System Support: Continued development of weight-reducing structural, thermal and optical components for advanced TMD systems. Continued development of EFEX-1 flight hardware. Performed lab test of 6-m CO2 MFL transmitter. Performed lab test of integrated 3-D solid state ladar and receiver breadboards. Continued joint composites program with Japan. Performed simultaneous 2-color HgCdTe imagery demonstration. Initiated design of 128x128 and 256x256 simultaneous 2-color HgCdTe arrays. Initiated design of DITP data fusion processor. Fabricated two ceramic hot gas lines. Began thrust chamber firings. Continued smart patch technology.
- $42,183 Atmospheric Interceptor Technology: Completed initial prototype seeker development and conducted initial hardware-in-the-loop (HWIL) tests. Conducted cooled window and forebody aero-optic shock tunnel tests. Completed preliminary design of solid DACS and deliver DACS propellant ground test unit (GTU). Completed integrated avionics unit final design. Fabricate prototype vehicle structures. Completed preliminary software specifications. Conducted System Requirements Review. Conducted Preliminary Design Review for developmental flight test vehicle. Conducted millimeter Wave (RF) technology development (lightweight Ka-band seeker transmitter).
- $69,848 Total

FY 1998 ($ in Thousands):

- $4,098 Space Surveillance System Support: Complete space qualification and deliver integrated STRV-2 experiment module. Deliver space qualified SCARLET concentrator solar array and launch on NASA Deep Space-1 mission. Deliver STRV 1c/d flight experiments and begin integration with spacecraft.
- $30,835 Interceptor System Support: Terminated EFEX 1 flight experiments and initiate effort to restructure EFEX program to reduce cost while increasing frequency of flight tests. Demonstrate 6-m MFL CO2 ladar transmitter integrated with receiver and controls. Fabricate 3-D solid state imaging ladar transmitter. Perform testing at AMOR to support down-select. Complete Si-APD ladar receiver. Complete thrust chamber firings. Perform imagery demo of 256x256 simultaneous 2-color HgCdTe FPAs. Host real time DITP algorithms to include real world NMD scenarios and target selection on WSSP processor in lab demo. Complete advanced ceramic DACS thrusters in hot fire testing. Initiate development of advanced carbon and ceramic DACS valves and hot gas lines. Coordinate LTS time dependent processing demonstration with SBIR program to develop LTS RAM. Initiate development of composite transmit/receive electronics tray for TMD-GBR. Flight qualify composite pedestal bulkhead for PACM missile.
- $34,933 Total

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FY 1999 ($ in Thousands):

–	$1,231	Power Program: Initiate engineering studies and evaluations to explore benefits of cryo cooled transmit and receive electronics for TMD-GBR system. Initiate advanced battery development effort for TMD and NMD interceptors. Complete analysis and prepare final report on SCARLET array on-orbit performance.
–	$2,219	Space Surveillance System Support: Launch STRV-2 flight experiments. Launch STRV 1c/d. Initiate data reduction efforts for STRV-2 and STRV 1c/d flight experiments. Initiate development of multifunctional spacecraft structure flight experiment.
–	$29,485	Interceptor System Support: Initiate restructured EFEX flight experiment program. Flight test composite pedestal bulkhead in PACM missile. Test prototype multifunctional interceptor structure. Integrate and lab demonstrate 3-D solid state transmitter and receiver. Demonstrate real time discrimination and data fusion algorithms simulating real world NMD discrimination problems on WSSP. Continue BMDO/Japanese RTM development for complex-shaped composite structures. Integrate SBIR LTS RAM in LTS sensor processing electronics testbed. Fabricate composite transmit/receiver module tray for TMD-GBR
–	$32,935	Total

Acquisition Strategy: The AIMST Project uses U.S. Army Space and Strategic Defense Command, DoD and DOE laboratories to fund contractors supported by relevant in-house expertise to meet the AIMST milestones. Weapons systems prime contractors acquire license agreements to use advanced manufacturing/producibility processes (e.g., composite materials, baffles and nozzles) developed by the AIMST Project. International funding (e.g., UK and Japan) and joint agency coalitions (e.g., NASA, DoE and ARPA) are assembled to obtain critical level of effort (e.g., US/UK STRV-2, BMDO/AF/ARPA Smart Structures, US/Japan Composites and superconducting materials programs). The AIT program plan will consist of development and validation of endoatmospheric kill vehicle technologies for potential use in advanced TMD systems, such as advanced NTWD, THAAD, MEADS and UAV/BPI; options for the design, fabrication, and test of the KKVs; options for KKV/booster integration and flight tests. USASSDC will provide technical and contract management of the AIT prime contract. On-going, competitively-awarded, CPFF contracts for the kill vehicle technologies within the AIT program will continue through the completion of ground testing and potential flight tests. The DITP program uses: USASSDC in-house expertise and contractors for ladar technology development, testing and demonstration; AF Philips Lab personnel and contractors to develop infrared detector technology; and BMDO personnel and contractors to lead integration activities, flight demonstrations and fusion processor development.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	68,409	31,492	29,412	156,101
Appropriated Value		31,492		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-1,533		

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	FY 1997	FY 1998	FY 1999	Total Cost
b. Internal Realignments		+4,974		
FY1999 President's Budget	69,848	34,933	32,935	164,499

Change Summary Explanation:

Funding: Execution of and funding for the AIT program was transferred to Project 1264 starting in FY98. .

Schedule: Launch of STRV-2 will be delayed until FY99 because of delays in completing spacecraft and delays and manifest conflicts for launch vehicle

Technical: EFEX-1 flight experiment canceled, EFEX program being restructured to reduce cost

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 National Missile Defense, PE 0603871C	811,416	941,142	950,473	864,435	664,930	359,444	313,406	Cont	Cont
1161 Advanced Sensor Technology, PE 0603173C	32,101	35,712	0	0	0	0	0	TBD	TBD
1161 Advanced Sensor Technology, PE 0603872C	3,299	0	0	0	0	0	0	0	4,569
1161 Advanced Sensor Technology, PE 0603875C	0	0	12,752	0	0	0	0	TBD	TBD
1270 Adv. Int. Mat & Sys Tech, PE 0603872C	0	0	0	0	0	0	0	0	9,137

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
AIT Aero-Optical shock tunnel tests (window #1)												
AIT Downselect to single prime contractor												
Initiate design of Advanced SCARLET												
3-m CO2 ladar transmitter demo												
Initiate Joint Composites Manufacturing Program with Japan												
Test THAAD DACs Bulkhead												
SCARLET design complete												
Solid state ladar amplifier demo												

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
3-m CO2 ladar receiver demo												
Demo superconductor ADC/MUX with GBI FPA												
6-m CO2 ladar amplifier test	X											
Solid state ladar 2-D imaging demo	X											
Deliver SAMMES and Sensor Isolation System to STRV-2			X									
Perform simultaneous 2-color HgCdTe imagery demonstration			X									
Initiate PACM composite bulkhead qualification					X							
Complete Data Reduction of ACTEX-I						X						
Deliver STRV-2 to Spacecraft contractor						X						
Award DITP system integration contract						X						
Host real-time DITP algorithms on WSSP processor and perform lab demo						X						
Initiate TMD-GBR composite tray							X					
Deliver Advanced SCARLET Array to Spacecraft Integrator							X					
Demo 6-m MFL CO2 ladar transmitter integrated with receiver and controls at AMOR							X					
Launch and evaluate SCARLET array								X				
Demonstrate full-up, real-time discrimination and data-fusion algorithms on WSSP (field test)								X				
Integrate and perform lab demo of 3-D solid-state transmitter and receiver								X				
Initiate cryo-GBR system studies									X			
Launch STRV-2									X			
PACM composite bulkhead flight test										X		
Launch STRV 1c/d											X	

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
LTS sensor processor with RAM demo											X	
Complete phase 1 US/Japan projects											X	
Fabricate TMD-GBR composite tray											X	
Complete STRV-2 Data Acquisition												X
Test prototype interceptor multifunctional structure												X

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1360 Directed Energy Program	93,846	122,010	58,813	58,635	58,367	58,181	57,911	Continuing	Continuing

To see the Air Force Program Element and Appropriations associated with Space Based Laser, see section C of this R2.

A. Mission Description and Budget Item Justification

BMDO's charter is to provide for defense against current and future missile threats. An effective missile defense against a wide variety of current and near-term projected threats will require boost phase intercept capability. The Space Based Laser (SBL) program was created to provide the nation with a highly effective, continuous, global boost phase intercept option for both theater and national missile defense. While BMDO is pursuing numerous terminal and midcourse intercept concepts, this program element, project number 1360, contains DOD's only boost phase intercept program that can provide national missile defense and operate in all theaters, regardless of size, geometry, or weather conditions. This system also provides many ancillary capabilities, including air defense, global surveillance and target detection and designation for other systems.

Unique features of an SBL missile defense system include global, 24 hour boost phase intercept capability and defense against surprise first strikes. The SBL system can destroy missiles whose range is greater than 75 miles, providing a robust first layer for both theater and national missile defenses-in-depth. The SBL system does not require prior knowledge of enemy launch site locations. The footprint of one SBL platform can cover approximately 10% of the earth. A constellation of twenty SBL platforms could provide overlapping full-time coverage of missile threats from theaters anywhere. Each SBL would be capable of destroying approximately 100 missiles with the initial fuel load. Capability for on-orbit refueling would be provided. An SBL system could defend against missiles without putting the lives of US military personnel at risk. With its long range and speed of light defense, it accomplishes boost phase intercept at the earliest possible moment, offering the highest probability that intercepted missile fragments (possibly containing active chemical/biological or nuclear materials) will fall within the attackers territory, not on defended assets.

The directed energy program is structured to address the key critical technical issues: (1) Can a chemical laser be built powerful enough to destroy a missile at militarily useful ranges? (Alpha program); (2) Can mirrors and optics be built large enough and easily enough? (Large Aperture Mirror Program (LAMP) and Large Optical Segment (LOS)); (3) Can the high power beam be controlled adequately? (Large Optics Demonstration Experiment, LODE); (4) Can the high power components of a Space Based Laser be integrated on the ground and operated as a system? (Alpha LAMP Integration (ALI)); (5) Can missile targets be acquired and tracked from space and can a laser be pointed and fired accurately enough? (Acquisition, Tracking, Pointing, and Fire Control, ATP/FC); (6) Can these key components be integrated into a functional unit suitable for space flight and remote operation? (Space Based Laser Readiness Demonstrator (SBLRD) Ground Demonstration); (7) Can the fully integrated system operate adequately on-orbit? (SBLRD Flight Demonstration).

Progress To Date. The program has demonstrated that the answer to questions 1 through 4 (and partially 5) is "yes," and has built devices that perform the respective functions. (1) The Alpha program's high energy chemical laser achieved weapons-class power for the first time in 1991. (2) LAMP and LOS demonstrated the ability to build optics of the required size with the successful fabrication of a 4-meter segmented mirror in 1989 and a key segment of an 11 meter mirror in 1993. (3) The

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Large Optics Demonstration Experiment (LODE) demonstrated the ability to control the projected (or outgoing) beam in low power laser experiments in 1987. (4) The Alpha LAMP Integration (ALI) experiment has demonstrated integrated open loop and closed loop fast steering mirror (FSM) and deformable mirror (DM) system operation. (5) The basic technology of acquiring and tracking missiles and pointing a high power laser beam from ground and space has been demonstrated by a number of programs. The ATP/FC technologies required (sensors, optics, processors, etc.) have been demonstrated at or near performance levels required for the Space Based Laser system. Stable low power laser beam pointing from a space platform was demonstrated at the same precision level required for an operational SBL in 1991 during the flight of the Relay Mirror Experiment (RME).

Current Status. The major building blocks have been developed, but key system integrations and tests lie ahead. Remaining tasks are: to integrate and test ATP/FC hardware and software (High Altitude Balloon Experiment (HABE)); to integrate the high power laser and the large optics beam director hardware with ATP/FC hardware and test; to integrate the system in a space qualified SBL Readiness Demonstrator (SBLRD) vehicle for ground and flight testing.

In FY96 and FY97, Congress provided additional program funding to complete ALI, accelerate design activities for a space demonstration, perform risk reduction and design validation demonstrations, produce a concept of operations (CONOPs) and design requirements for an operational SBL system, and revitalize the SBL technology development efforts. The increased funding allowed us to preserve vital infrastructure, restore the ALI program to its original scope, accelerate the ATP/FC program, continue the advanced nozzle and phase conjugation developments, and begin the process of selecting a site for the new ground test facility.

PROGRAM ACCOMPLISHMENTS AND PLANS:

ALI high power testing was completed in October 1997. The Alpha device and facility were reactivated and the test team reconstituted. In Sep 96, a high power reactivation test of the Alpha laser device was successfully completed after a down time of over two years. In ALI, all major assemblies were fabricated, integrated, and tested in the test chamber. In Dec 96, an Alpha hot flow test was conducted while performing a low power integration check-out of the ALI beam train. On 20 Feb 97, the first integrated high power test was successfully accomplished. The second high power test was completed on 16 Jul 97, with the outgoing wavefront sensor (OWS) controlling the steering of the high power beam through the 4 meter LAMP mirror. The third high power test was completed on 22 October 1997, with the OWS controlling the steering and wavefront error of the high power beam through the 4 meter LAMP mirror. Procurement of an uncooled DM was completed. As many as five high power tests will be conducted in FY98 to establish SBLRD laser reactant flow conditions, develop methods for aligning the SBLRD mirrors in space, and incorporate the uncooled DM into the beam train.

In compliance with Congressional language, design activities for the follow-on space qualified vehicle ground demonstration were restarted, and the Cost Analysis Requirements Document (CARD) was updated with emphasis on the CONOPS, design requirements, satellite design, and launch vehicle design. Design reviews for the demonstrator space vehicle and operational SBL system concepts occurred in Dec 96. The facility design for the Space Test Facility (STF) was 60% completed in FY97. Design activity for the SBLRD is continuing toward a design review for the SBLRD in 2QFY98.

The ATP/FC program completed fabrication and test of the illuminator laser that will be used in the field experiments. Integration into the High Altitude Balloon Experiment (HABE) platform was completed and testing begun. With the FY97 Congressional added funding, integrated ground testing will be completed in early FY98, and the first flight test will occur in FY00.

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Work resumed on high payoff advanced technologies. The unique facility (Large Optics Diamond Turning Machine) and capability to build the Alpha resonator optics was restored, and fabrication of the new, advanced, lightweight, uncooled resonator optics began. Fabrication continues into FY00 and is followed by a high power test of the new uncooled resonator in FY00 (assuming POM funding).

FY 1997 ($ in Thousands):

- $29,200 ALI/Alpha High Power Testing: Completed high power revalidation test of Alpha laser. Completed assembly and system integration (Level 200 and 300) experiments on ALI at low power. Completed open loop and closed loop high power tests to demonstrate and characterize integrated laser and beam control performance at near weapon scale power levels.
- $44,687 Space Based Laser Readiness Demonstrator (SBLRD): Completed design updates for the SBL Readiness Demonstrator vehicle and the space test facility. Initiated long-lead procurements of the uncooled resonator for SBLRD. Continued SBLRD design effort toward an Interim Design Review (IDR). Completed reactivation and recertification of the Large Optics Diamond Turning Machine (LODTM) at Lawrence Livermore National Laboratory (LLNL). Maintained the LODTM in operating condition. Completed the test of the first advanced nozzle module and the initial auto-alignment tests.
- $5,130 SBL System: Completed design and requirement updates for the operational SBL spacecraft. Completed update of the Cost Analysis Requirements Document.
- $4,229 Scorpius: Completed design, fabrication and ground test of launch vehicle propulsion and non-propulsion components to flight test a sub-orbital Launch Vehicle Technology Testbed (LVTT). Continued fabrication and development of additional vehicles for flight tests in FY98. Began design of 20,000 lb thrust engines for tests in FY98.
- $1,900 Advanced Technologies: Completed the fabrication of optics for the phase conjugation experiment.
- $8,700 High Altitude Balloon field Experiment (HABE): Completed passive track laboratory tests in preparation for active track laboratory tests and passive and active tracking tests against boosting scaled rockets. Restarted balloon segment to prepare for checkout flight in early FY99 and flight test in FY00.
- $93,846 Total

FY 1998 ($ in Thousands):

- $2,000 ALI Test Final Report: Complete test data reduction and archiving. Complete final test report.

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- $98,010 Space Based Laser Readiness Demonstrator (SBLRD): Complete and demonstrate operation of new light-weight uncooled deformable in high power beam train. Develop and test autonomous alignment optimization methods for the resonator and beam train optics. Characterize system performance for SBLRD laser reactant flow conditions. Test water cooled advanced nozzles. Maintain operation of the Large Optics Diamond Turning Machine (LODTM) at Lawrence Livermore National Laboratory (LLNL) for production of uncooled laser resonator. Prepare uncooled resonator optics blanks and begin fabrication. Prepare coating chamber for coating of annular optics. Complete design effort leading to an Interim Design Review (IDR). Continue design effort to a Preliminary Design Review (PDR). Complete preferred site designation and begin environmental assessment. Complete facility design for site specific requirements. Award facility construction contract. Includes civilian salaries and other support costs for Air Force Space and Missile Systems Center (SMC) SBL Project Office.
- $6,000 SBL System: Continue SMDC modeling and analysis support using EADSIM. Conduct mission analysis, and refine operational system concept of operations and requirements. Conduct target lethality experiments. Perform minimal baseline operational system design development.
- $11,000 Acquisition, Tracking, Pointing, and Fire Control (ATP/FC): Complete active track laboratory tests. Complete passive and active tracking tests against boosting scaled rockets. Deploy to White Sands Missile Range (WSMR), NM, and complete WSMR ground test against boosting missiles (targets of opportunity). Continue fire control algorithm development.
- $5,000 Advanced Technologies: Complete component integration for the NACL phase conjugation experiment.
- $122,010 Total

FY 1999 ($ in Thousands):

- $47,313 Space Based Laser Readiness Demonstrator (SBLRD): Conduct high power tests of reverse wave suppression techniques and fluorine-free ignition. Test regeneratively cooled advanced nozzles, and fabricate advanced nozzle rings. Continue fabrication and test of uncooled resonator optics using the LODTM machine at LLNL. Begin coating of resonator optics. Begin preparation of facility for test of uncooled resonator in FY00. Complete PDR design effort, and begin activities leading to a critical design review (CDR). Initiate procurement of the primary mirror. Begin new ground test facility construction. Includes civilian salaries and other support costs for Air Force Space and Missile Systems Center (SMC) SBL Project Office.
- $1,500 SBL System: Continue SMDC modeling and analysis support using EADSIM at modest level. Continue mission analysis, CONOPs development, and requirements development.
- $10,000 Acquisition, Tracking, Pointing, and Fire Control (ATP/FC): Perform checkout flight of balloon segment and prepare for flight test of ATP payload in FY00. Continue fire control algorithm development.
- $58,813 Total

Acquisition Strategy: BMDO's contract to build an SBL ("Zenith Star") was competed in 1988 and awarded to (then) Martin Marietta. The ALI and SBLRD design efforts are performed under this contract. The Alpha laser is maintained and operated under a BMDO contract to TRW. In FY98 the Air Force will assume execution responsibility for the space demonstration and related technology. The Air Force acquisition strategy is still in development but a new contract award in the 4QFY98 is anticipated. Existing contracts will be used to bridge to the new contract.

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	PROJECT 1360

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	95,930	28,877	28,539	229,834
Appropriated Value		126,877		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-4,790		
b. Internal Realignments		-77		
FY1999 President's Budget	93,846	122,010	58,813	351,143

Change Summary Explanation:

Funding: Congress increased the FY98 President's Budget Request to continue development of the Space Based Laser to the point where it is a technically viable option for ballistic missile defense. A portion of the increased funding was used to accelerate completion of the ALI high power test and the HABE active tracking tests so that results can be used for the design of the SBL Readiness Demonstrator (SBLRD). Remaining increased funding was used to begin preparation of the test facility needed to test the SBLRD, continue the design phase, and initiate procurement for long lead items such as the uncooled optics for the laser resonator. This project is responsive in FY98 to the congressional language accompanying the increased funding.

Resources for this project have been augmented based on revised BMDO FY98-03 program priorities. This project continues the SBL program in the outyears at a low level. It preserves the critical portions of the infrastructure required to maintain an option of deploying highly effective global defenses in the future. A sustaining technology development effort is preserved which develops and tests, in the laboratory, components of an SBLRD such as an advanced uncooled resonator.

Schedule:

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
AF 4779 Space Based Laser, PE 0603876F	0	0	35,000	35,002	34,994	34,980	34,968	TBD	TBD

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	PROJECT 1360

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
ALI beam expander integration complete												
Preliminary Design Review of new (completely uncooled)Alpha resonator optics												
Low power ALI experiments (Series 100) complete												
LODTM back on line												
ALI Assembly & Integration experiments (Series 200) complete	X											
Alpha high power restart test	X											
ALI system integration experiments (Series 300) complete		X										
First ALI high power diagnostics test		X										
ALI closed loop high power test IIA				X								
ALI closed loop high power test IIB					X							
Integrated test of uncooled deformable mirror						X						
Passive tracking tests against boosting scaled rockets						X						
Active tracking tests against boosting scaled rocket complete							X					
WSMR active track ground test against full scale boosting target								X				
Fabrication of uncooled rear and outer cone assemblies complete										X		
HABE Flight - Balloon checkout flight											X	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD PROJECT 1651

COST (*$ In Thousands*)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1651 Innovative Science and Technology (IST)	0	4,811	0	0	0	0	0	TBD	TBD

A. Mission Description and Budget Item Justification

To prepare to meet critical future active defense needs, advanced technology programs invest in an aggressive program of high leverage technologies that yield markedly improved capabilities across a selected range of boost phase and terminal defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are to provide: (1) component technologies that offer improved performance or reduced costs for BMDO acquisition programs; (2) a better understanding of the material characteristics and physics for processes that form the basis of technologies that support these acquisition programs; and (3) technical solution options to mitigate unpredicted threats. Unlike other BMDO projects that fund near term technology and testing efforts, this advanced technology initiative invests seed money in high-risk technologies that could significantly change how BMDO develops future systems. The technologies pursued include: next generation sensors, power, information processing, optics, advanced materials, propulsion, and communication. This specific project will lead to the availability of improved imaging systems for a variety of ballistic missile defense applications.

FY 1998 ($ in Thousands):

- $4,811 Provide research and development support for a pilot production line for Photoconductor on Active Pixel (POAP) detectors, for both visible and x-ray imaging applications.
- $4,811 Total

FY 1999 ($ in Thousands):

- $
- $
- $
- $0 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	2,233	0	0	2,233
Appropriated Value		5,000		

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD
	PROJECT 1651

	FY 1997	FY 1998	FY 1999	Total Cost
Adjustments to Appropriated Value				
a. General Reductions (FFRDC, Inflation, etc.)		-189		
b. Internal Realignments		0		
FY1999 President's Budget	0	$4,811	0	$4,811

Change Summary Explanation:

Funding: FY97 funding transferred to PE0602173C as part of an internal realignment of Science and Technology Funding. Funding increase in FY98 reflects congressional plus-up for Photoconductor on Active Pixel (POAP) research and development.

Schedule:

Technical:

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1651 Innovative Science and Technology, PE 0602173C	58,716	60,547	24,024	23,632	26,084	29,478	30,334	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Complete support for design phase of facility								X				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD		PROJECT 1660

COST (*$ In Thousands*)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1660 Statutory and Mandated Programs *	4,617	4,004	0	0	0	0	0	TBD	TBD

* FY99-03 funding for part of this project transferred to PE 0602173C. See that PE/R-2 for FY99-03 activities.

A. Mission Description and Budget Item Justification

To prepare for critical future missile defense needs, advanced technology programs will invest in a balanced program of high leverage technologies that yield improved capabilities across a selected range of boost phase and terminal missile defense interceptors, advanced target sensors, and innovative science. The objectives of these investments are component technologies with improved performance or reduced costs for acquisition programs, and technical solution options to mitigate advanced and unpredicted threats.

Two specific programs in advanced technology are managed under this project:

1. Technology Applications
2. Historically Black Colleges and Universities/Minority Institutions (HBCU/MIs)

The Technology Applications (TA) Program, established in 1986, makes technology from all parts of BMDO available to federal agencies, state and local governments, and U.S. business and research interests. The program objective is to develop and support the transfer of BMD derived technology to other Department of Defense applications as well as other federal, state and local government agencies, federal laboratories, universities, and the domestic, commercial, and private sector. Incorporation of these technologies by the private sector and other government agencies can result in reduced unit costs and further improvements to be made available for applications in BMDO systems. This program will not be funded after FY98, and is subject to termination.

The HBCU/MI Program increases and improves the participation of minority colleges and institutions in the BMDO program. It also responds to Section 832 of Public Law (PL) 101-510, which establishes a specific goal for HBCUs and MIs within the overall five percent goal for minority business contracts, and introduces them to BMDO technologies and the particulars of the BMDO procurement process. Starting in FY99, this program has been transferred to PE 0602173C.

Each program will focus, to the maximum extent feasible, on innovative technologies in support of future BMD sensor and interceptor systems. These systems will require processing, sensor, power, propulsion, materials and BMC3 capabilities beyond those currently being developed. An important goal of each program is to identify, develop, and demonstrate innovative technologies which will dramatically improve BMD system performance.

FY 1997 ($ in Thousands):

- $850 TA Database: Maintained up-to-date information on potential BMD programs that have commercial applications; and implemented graphics and interactive modes into national information infrastructure on BMD-sponsored technologies.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD
	PROJECT 1660

- $650 Panel Reviews: Provided assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.
- $701 Outreach: Developed publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc.
- $1,000 Networking: Expanded results of technology transfer by working with other federal technology transfer organizations and activities such as the OSD Director, DDR&E Office of Technology Transition, NASA and DOE. Interacted with professional/technical associations and societies involved with technology transfer and commercialization. Initiated new activities to include technology transfer demonstration projects.
- $1,416 HBCU/MI program will award approximately 10 contracts.
- $4,617 Total

FY 1998 ($ in Thousands):

- $503 TA Database: Maintain up-to-date information on potential BMD programs that have commercial applications. Update graphics and interactive modes into national information infrastructure on BMD-sponsored technologies.
- $543 Panel Reviews: Provide assistance to large, medium and small businesses wishing to bring BMD supported technology to the commercial market.
- $759 Outreach: Develop publications, brochures, target articles for journals and newspapers, quarterly newsletters, conference exhibits, ads and reports on BMDO technology, etc.
- $846 Networking: Expand results of technology transfer by working with other federal technology transfer organizations and activities such as the OSD Director, DDR&E Office of Technology Transition, NASA and DOE. Interact with professional/technical associations and societies involved with technology transfer and commercialization. Initiate new activities to include technology transfer demonstration projects.
- $1,353 HBCU/MI program will incrementally fund 10 contracts.
- $4,004 Total

FY 1999 ($ in Thousands):

- $0
- $0 Total

Acquisition Strategy: These competitively awarded programs are in response to annual announcement of research opportunities. Proposals received are judged according to technical and commercial potential.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD
	PROJECT 1660

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	4,707	4,161	4,113	18,380
Appropriated Value		4,161		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-157		
b. Internal Realignments		0		
FY1999 President's Budget	4,617	4,004	0	14,020

Change Summary Explanation:
Funding: FY99-03 funding for HBCU/MI portion of this project transferred to PE 0602173C. The Technology Applications Program is not be funded after FY98.
Schedule: None
Technical: None

C. Other Program Funding Summary ($ in Thousands)

The HBCU/MI program feeds innovative technologies into all other BMD programs, and the Technology Applications program supports the transfer of technology from all BMD programs

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1660 Statutory and Mandated Programs, PE 0602173C	63,460	49,081	62,842	55,738	49,211	40,244	37,199	Cont	Cont
1651 Innovative Science and Technology, PE 0602173C	58,716	60,547	24,024	23,632	26,084	29,478	30,334	Cont	Cont
1651 Innovative Science and Technology, PE 0603173C	0	4,811	0	0	0	0	0	0	4,811

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Technology Applications												

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Annual Report			X				X					
Special Tech Applications Report		X		X		X		X				
BMDO Update	X	X	X	X	X	X	X	X				
HBCU/MI Solicitation/Review for incremental funding	X				X							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

BUDGET ACTIVITY	PE NUMBER AND TITLE	DATE	PROJECT
3 - Advanced Technology Development	0603173C Support Technologies - ATD	February 1998	3352

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3352 Modeling & Simulations **	2,502	5,060	0	0	0	0	0	TBD	TBD

* FY99 - 03 Funding transferred to PE 0603874C. See that PE summary for FY99 - 03 activities.

A. Mission Description and Budget Item Justification

This project ensures timely availability of reliable, cooperative, and cost-effective BMDO and Service-provided Modeling, Simulation, & Networks (MS&N) tools and capabilities responsive to Ballistic Missile Defense Organization (BMDO) requirements. This project provides for the planning, coordination, program management, and technical oversight of system level Modeling and Simulation (M&S) for the Theater Air and Missile Defense (TAMD) and the National Missile Defense (NMD) Deployment Readiness Programs. This cost effective approach reduces the high cost of missile test programs and generates the information needed to make timely and informed operational, requirements, performance, design/cost/risk tradeoffs, mitigation and resource allocation decisions.

MS&N programs funded by this project include Mission Oriented Information Technology Resources (ITR), BMDO Data Centers, and the Ballistic Missile Defense (BMD) Virtual Data Center (VDC).

This project provides acquisition and support services for the design, development, modernization, and control of BMDO Information Technology Resources (ITR). The objective for this program is to provide responsive ITR support and services via a flexible, responsive architecture to satisfy validated current and projected user ITR requirements. Projects to be supported via these tasks include the VDC project, the Wargame 2000 initiative, the creation of a comprehensive ITR data base of requirements, and the development of a mission oriented ITR System Architecture that will be responsive to and satisfy these requirements.

This project also funds the BMDO Data Center Program. The purpose of the BMDO Data Centers Program is to archive, manage, develop and distribute data products, and provide remote access to data from large volumes of scientific and technical data/information generated from experiments, tests, demonstrations, wargaming, simulations, model executions, Analysis of Alternatives (AOA), and evaluations. Operation and management of the Data Center activities are accomplished at four sites: Advanced Missile Signature Center (AMSC), Arnold Engineering and Development Center, Arnold Air Force Base, Tullahoma, TN; Backgrounds Center of Expertise (BCOE), Naval Research Laboratory, Washington, DC; Missile Defense Data Center (MDDC), Space and Missile Defense Command, Huntsville, AL; and the BMD Simulation Support Center (SSC), Joint National Test Facility (JNTF), Falcon AFB, CO. Each joint data center specializes in a particular discipline and is co-located with an existing DoD center of expertise.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD
	PROJECT 3352

FY 1997 ($ in Thousands):

- $1,457 This task supported BMDO's Mission Oriented ITR program to include the modernization of the BMDO's computer capabilities throughout the BMDO and acquisition of equipment based on BMDO program priorities. These priorities included BMD wargames, TAMD AOA Phase II, TAMD Architecture Analysis, Computational Fluid Dynamics (CFD) Analysis, NMD Architecture Analysis, and Command, Control, Communications, Computers, Intelligence, Surveillance, Recognizance (C4ISR).
- $500 Provided funding for the BMDO Data Centers Program to archive, manage, develop and distribute data products, and provide remote access to all relevant BMD data. Specific priorities included: AMSC - development, test and evaluation of the VDC (Alpha) prototype and preparation of Midcourse Space Experiment (MSX) program support; BDC - development, test and evaluation of the VDC (Alpha) prototype and transfer of MSX program support; MDDC - development, test and evaluation of the VDC (Alpha) prototype; BMD SSC - development of functional data center capabilities supporting M&S, joint interoperability and integration experiments and wargame exercises.
- $545 Provided a portion of infrastructure and core capability funding for the JNTF.
- $2,502 Total

FY 1998 ($ in Thousands):

- $1,264 Continue to fund modernization and upgrades of Mission Oriented ITR in BMDO and BMDO-funded missile defense development programs in order to satisfy validated requirements of the ITR user community.
- $3,796 Continue to provide funding for the BMDO Data Centers Program to archive, manage, develop data products, distribute and provide remote access to all relevant BMD data. Specific priorities include: AMSC - support VDC design, development, testing, implementation and Initial Operational Capability (IOC), MSX data management in coordination with Phillips Lab; BDC - support VDC design, development, testing, implementation and IOC, transition to backgrounds data center of expertise; MDDC - support VDC design, development, testing, implementation and IOC; BMD SSC - support VDC design, development, testing, implementation and IOC, and establish initial functions and capabilities as back-up data archive.
- $5,060 Total

FY 1999 ($ in Thousands):

- $0 Total; all FY99 funding transferred to project 3352, PE 0603874C.

Acquisition Strategy: The tasks in this project have been met through full and open contractual competition to support Technology Follow-on M&S requirements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD
	PROJECT 3352

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	2,002	1,554	1,898	5,454
Appropriated Value		1,554		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-200		
b. Internal Realignments		+3,706		
FY1999 President's Budget	2,502	5,060	0	7,562

Change Summary Explanation:

Funding: The Virtual Distributed Hardware-in-the-Loop Test Bed (VDHTB) program originally funded by project 3352 has been transferred to project 1155 to align technical responsibilities within the Technical Operations Directorate. Also, due to BMDO's reorganization after the President's Budget Submission last year: the Operation and Maintenance of the JNTF was transferred to a new project (3353); the Mission Oriented ITR was transferred from project 4162 to project 3352; and the BMD Data Center activities were transferred from project 1155 to project 3352. All FY99 funding transferred to project 3352, PE 0603874C.

Schedule: None.

Technical: None.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program, PE 0603871C	34,803	6,685	0	0	0	0	0	0	57,529
3352 Joint TMD, PE 0603872C	66,409	55,558	11,605	12,013	11,922	11,847	11,836	TBD	TBD
3352 BMD Technical Support, PE 0603874C	0	0	44,886	33,038	32,499	32,566	29,518	Cont'd	Cont'd

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Conduct MSX Data Management Support					X							
VDC Software & Hardware Acquisition						X	X					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 3 - Advanced Technology Development

PE NUMBER AND TITLE: 0603173C Support Technologies - ATD

PROJECT: 3352

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Conduct VDC (Beta Version) Design & Development							X					
Conduct VDC (Beta Version) T&E Program							X	X				
Establish and Execute VDC IOC Implementation								X				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD PROJECT 4000

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4000 Operational Support	27,297	29,396	30,203	28,798	28,899	29,811	30,048	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project provides support in three basic areas: personnel and related support costs; funding to meet cost fluctuations and contract terminations; management overhead required for the Support Technology program..

Personnel and related support costs common to all Support Technology projects include support of the Office of the Director, Ballistic Missile Defense Organization and his staff located within the Washington, DC area, as well as BMDO's Executing Agents within the US Army Space & Strategic Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office, and the National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits, and infrastructure costs such as rents, utilities, supplies, etc.

The BMDO prioritizes funding within this project to meet operational, contractual, and statutory fiscal requirements for the Support Technology program. Operational requirements include reimbursable services acquired through the Defense Business Operating Fund (DBOF), such as accounting services provided by the Defense Finance and Accounting Service (DFAS). Contractual requirements include reserves for special termination costs on designated contracts and provisions for terminating other programs as required. BMDO has additional requirements to provide for foreign currency fluctuations on its limited number of foreign contracts. Finally, statutory requirements include funding for charges to canceled appropriations in accordance with Public Law 101-510.

Assistance required to support BMDO overhead management functions for the Support Technology program is contained in this project. This assistance ranges from operational contracts to fully support functions such as ADP operations, Access control offices, and graphics support, to supportive efforts required, as well as to supplement the BMDO government personnel. Typical efforts include cost estimating, security management, contracts management, strategic relations management and information management. These efforts include assessment of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across BMDO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. The requirement for this area is based on most economical and efficient utilization of contractors versus government personnel.

The Fiscal Year 1996 Defense Authorization Act eliminates the management program element effective with the Fiscal Year 1997 President's Budget submission. This overhead management and indirect program support funding has been realigned in accordance with Public Law 104-106.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603173C Support Technologies - ATD PROJECT 4000

FY 1997 ($ in Thousands):

- $27,297 Provided management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $27,297 Total

FY 1998 ($ in Thousands):

- $29,396 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $29,396 Total

FY 1999 ($ in Thousands):

- $30,203 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $30,203 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	26,907	30,206	31,992	89,305
Appropriated Value		30,206		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.)		-1,120		
b. Internal Realignments		+310		
FY1999 President's Budget	27,297	29,396	30,203	87,096

Change Summary Explanation:

Funding: Management costs realigned to technical program elements effective with FY 1997.
Schedule: None
Technical: None



THAAD System (Dem / Val)
PE 0603861C

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2260 Theater High Altitude Area Defense	549,579	390,785	497,752	37,000	5,400	0	0	0	3,846,142

A. **Mission Description and Budget Item Justification**

The Theater High Altitude Area Defense (THAAD) System is being designed to negate theater ballistic missiles (TBM) at long ranges and high altitudes. Its long-range intercept capability will make possible the protection of broad areas, dispersed assets, and population centers against TBM attacks. The THAAD System includes missiles, Palletized Loading System (PLS) launchers, Battle Management/Command, Control, Communications, Computers, Intelligence (BM/C4I) units, THAAD Radars, and support equipment. The THAAD Radar (formerly known as Ground Based Radar) provides threat early warning, threat type classification, interceptor fire control, external sensor cueing, and launch and impact point estimates for the THAAD System. The THAAD Radar is based on state-of-the-art, solid-state, X-band radar technology. THAAD will be interoperable with both existing and future air defense systems. This netted and distributed BM/C4I architecture will provide robust protection against the TBM threat spectrum. THAAD is pursuing integration of THAAD BM/C4I with the Project Manager (PM), Air Defense Command and Control Systems (ADCCS) to take advantage of previous Army developments that can be incorporated into the THAAD program.

The Demonstration/Validation (Dem/Val) program will develop a design for the objective THAAD system and demonstrate the capabilities of the system in a series of 13 flight tests. The residual hardware resulting from the THAAD Dem/Val program, including the User Operational Evaluation System (UOES) missile option, will be used for a prototype system called the UOES. The UOES, used primarily for early operational assessment and for soldiers to influence the final design, will also be available for limited use as a contingency capability during a national emergency. The UOES will consist of 40 missiles with 4 launchers, 2 BM/C4I units, 2 THAAD Radars and support equipment. The THAAD system design will be developed and tested in the Engineering, Manufacturing, and Development (EMD) phase leading to low rate initial production and subsequent fielding in FY 06.

During FY95 - FY99 the Dem/Val flight test program is being conducted at White Sands Missile Range (WSMR), New Mexico. The flight test schedule consists of flight and system tests which began on April 21, 1995 with a successful first flight of the THAAD missile. To date, seven flight tests have been conducted with the eighth flight planned for 2Q98. The targets for the flight test program are being developed under the Tactical Missile Defense Targets contract (Project 3354).

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

The THAAD Program continued Dem/Val hardware and software design, development and delivery in support of integration and acceptance testing for flight testing at WSMR. The Dem/Val THAAD radar was delivered to WSMR on July 17, 1995, and has participated in flights 3, 4, 5, 6, and 7. The THAAD Dem/Val Radar has performed in the shadow mode to the test range radar and was the primary sensor on flight 7. The first UOES Radar was delivered to WSMR May 3, 1996,

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

and completed range integration and test in September 1996. It will be used for flight testing beginning with flight 8 and for the remainder of the Dem/Val flight tests. The first flight was successfully conducted at WSMR on April 21, 1995, proving the THAAD missile propulsion system booster/kill vehicle separation, seeker shroud cover deployment, seeker data, uplink/downlink communications from the Radar Interface Unit (RIU) to the missile, and pre-planned command destruct. The second flight was conducted on July 31, 1995, as a planned non-intercept, guidance and control test. The missile successfully performed the THAAD Energy Management Steering (TEMS) maneuver which resulted in nominal velocities and accelerations. The kill vehicle successfully maneuvered in response to planned In-Flight Target Updates (IFTUs). The third flight was a non-intercept fly-by test against a Storm target on October 13, 1995. The missile collected critical seeker data and the BM/C4I generated the fire control solution and sent the launch command to the interim launcher. During Flight 4, on December 13, 1995, much success was demonstrated even though a planned intercept was not accomplished. The flight test demonstrated seeker close-loop track, kill vehicle homing guidance, and THAAD Radar generation of uplink messages. Detailed analysis of the failed intercept verified that a software error in avionics processing caused the missile to perform an errant maneuver during flyout that consumed fuel required for interceptor divert and control for end game. Flight 5 was conducted March 22, 1996. The flight test successfully demonstrated the first launch from the tactical Palletized Loading System launcher. However, during kill vehicle/booster separation, a power interrupt to the integrated avionics processor caused the missile computer to reset to a prelaunch condition, which predestined the missile on a ballistic flight path and prevented target intercept. During flights 4, 5, and 6, the THAAD Radar successfully tracked both the THAAD interceptor and the target. During flights 4 and 6, it properly maintained track on the interceptor and seeker shrouds during shroud separation. All radar mission events, times, and durations, went as predicted in pre-mission analysis. Flight 6 was conducted July 15, 1996. The THAAD missile did not intercept the target due to the seeker not providing the proper imagery to the onboard computer. Analysis and testing determined the most likely cause of failure was dewar contamination. Although an intercept was not achieved, critical data was obtained on how the seeker viewed the target. Flight 7 conducted March 6, 1997, failed to achieve an intercept due to the inability to provide in-flight course correction from the missile Divert and Attitude Control Systems (DACS). Post flight analysis indicates that the THAAD radar, launcher, and BM/C4I segments performed nominally, and that the failure mode resides in the missile kill vehicle in the electronics connection between the kill vehicle battery and the DACS.

FY 1997 ($ in Thousands):

- $414,695 Major Contracts: Continued system flight test program and support. Conducted Radar System Test #1 (RST-1). Completed fabrication and integration of UOES radars. Conducted THAAD Radar characterization tests at United States Army Kwajalein Atoll (USAKA) in conjunction with the Theater Critical Measurements Program (TCMP)-2.
- $58,909 Support Contracts: Continued software independent verification and validation. Continued nuclear environment survivability analysis. Continued hit assessment, discrimination, and guidance, navigation and control algorithm development. Continued hit to kill lethality analysis. Continued integration and support THAAD flight testing.
- $42,193 Government Furnished Equipment (GFE)/Other: Continued integration and testing of Joint Tactical Information Distribution System (JTIDS) radios, launch support, BM/C4I, weapon system deck model, and simulation efforts. Continued system threat vulnerability assessment. Maintained integrated logistics and product assurance efforts. Provided system engineering support to THAAD flight tests to validate test results with predicted performance simulations. Continued pursuing integration of THAAD BM/C4I with PM, ADCCS to take advantage of previous Army developments of force operations software.

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

- $19,272 In-house support: Maintained government salaries and benefits, travel, training, etc.
- $11,219 Targets: Continued development and delivery of targets to support THAAD flight tests and THAAD Radar system tests. Maintained infrastructure to support TMD targets.
- $3,291 Operational Test and Evaluation (OT&E): Conducted independent assessment of the THAAD System.
- $549,579 Total

FY 1998 ($ in Thousands):

- $239,766 Major Contracts: Conduct pre-EMD risk mitigation activity and continue system flight test program and support. Exercise UOES missile option. Begin procurement, fabrication and integration of UOES missiles.
- $58,315 Support Contracts: Continue software independent verification and validation. Continue nuclear environment survivability analysis. Continue hit assessment, discrimination, and guidance, navigation and control algorithm development. Continue hit to kill lethality analysis. Continue integration and support THAAD flight testing.
- $61,134 Government Furnished Equipment (GFE)/Other: Continue integration and testing of Joint Tactical Information Distribution System (JTIDS) radios, launch support, BM/C4I, weapon system deck model, and simulation efforts. Continue system threat vulnerability assessment. Maintain integrated logistics and product assurance efforts. Provide system engineering support to THAAD flight tests to validate test results with predicted performance simulations. Continue pursuing integration of THAAD BM/C4I with PM, ADCCS to take advantage of previous Army developments of force operations software.
- $19,420 In-house support: Maintain government salaries and benefits, travel, training, etc.
- $8,354 Targets: Continue development and delivery of targets to support THAAD flight tests and THAAD Radar system tests. Maintain infrastructure to support TMD targets
- $2,278 Lethality Analysis: Continue lethality simulation code validation.
- $1,518 Operational Test and Evaluation (OT&E): Conduct independent assessment of the THAAD System.
- $390,785 Total

FY 1999 ($ in Thousands):

- $342,065 Major Contracts: Complete system flight test program and support. Continue pre-EMD risk mitigation activities and preparation for the MSII DAB.
- $54,440 Support Contracts: Continue software independent verification and validation. Continue nuclear environment survivability analysis. Continue hit assessment, discrimination, and guidance, navigation and control algorithm development. Continue hit to kill lethality analysis. Continue integration and support THAAD flight testing.

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

- $62,984 Government Furnished Equipment (GFE)/Other: Continue integration and testing of Joint Tactical Information Distribution System (JTIDS) radios, launch support, BM/C4I, weapon system deck model, and simulation efforts. Continue system threat vulnerability assessment. Maintain integrated logistics and product assurance efforts. Provide system engineering support to THAAD flight tests to validate test results with predicted performance simulations. Continue pursuing integration of THAAD BM/C4I with PM, ADCCS to take advantage of previous Army developments of force operations software.
- $21,300 In-house support: Maintain government salaries and benefits, travel, training, etc.
- $10,324 Targets: Continue development and delivery of targets to support THAAD flight tests and THAAD Radar system tests. Maintain infrastructure to support TMD targets.
- $5,272 Lethality Analysis: Continue lethality simulation code validation.
- $1,367 Operational Test and Evaluation (OT&E): Conduct independent assessment of the THAAD System.
- $497,752 Total

Acquisition Strategy The THAAD Acquisition Strategy approved for the Dem/Val phase specified full and open competition for THAAD system integration, missiles, launchers, and BM/C4I. The TMD Ground Based Radar (GBR) Acquisition Strategy also specified full and open competition for Dem/Val. The Concept Definition phase, completed in 1992, involved three contractor teams and defined concepts and preliminary designs for the THAAD System. The THAAD Dem/Val contract was competitively awarded to Lockheed Missiles and Space Company in September 1992. The Dem/Val program will develop a design for the THAAD System, and the contract contains an option for production of the 40 UOES missiles based on the design demonstrated in the Dem/Val flight test program. The THAAD Radar (formerly known as TMD-GBR) Dem/Val contract was competitively awarded to Raytheon Company in September 1992. The Dem/Val phase includes the development and test of one Dem/Val radar and two UOES radars.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY 1998/1999 President's Budget	341,307	294,647	16,778	1,218,550
Appropriated Value		406,127		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-15,342		
b. Internal Realignments		0		
FY1999 President's Budget	549,579	390,785	497,752	1,944,571

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

Change Summary Explanation:

Funding: (+221,145) FY 97: Funds were reprogrammed as a result of perturbations in the DEM/VAL flight test which caused a slip to the DEM/VAL program and corresponding slip to the EMD authority to proceed. (+111,480) FY 98: Realignment from EMD to Dem/Val.

FY 97: Funds were reprogrammed from Dem/Val to EMD.

FY99: Increase per Mission Realignment based on the QDR, realignment of funds from FY98 to FY99 and Reprogramming from EMD (0604861C) to this PE.

Schedule: The Milestone II DAB Review milestone has slipped due to restructuring the THAAD flight test program (as endorsed by the QDR), including the addition of two more flight tests, and implementing the missile assessment team recommendations.

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
THAAD Procurement, SSN C49400	0,000	0,000	0,000	0,000	0,000	0,000	131,952	Cont	Cont
THAAD MILCON, 0604861C	0,000	0,000	0,000	0,000	0,000	0,000	4,689	Cont	Cont
THAAD EMD, 0604861C	66,737*	0,000	323,942	596,310	574,513	602,713	501,974	Cont	Cont

* OSD has submitted a reprogramming action to transfer $66.737M from EMD to Dem/Val.

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Dem/Val Radar Integration and Test (I&T) Complete												
System Design Review												
UOES Radar 1 I&T Complete												
Radar System Test #1	*											
UOES Option Award							X					
UOES Radar 2 I&T Complete	*											
Software Specification Review									X			
Integrated System Tests Complete										X		
Radar System Test #2		*										

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Milestone II											X	

DEM/VAL MILESTONES:
1st UOES Missile Delivery-2Q00
UOES Delivery Complete-2Q01

First Unit Equiped - 4QFY06

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD
	PROJECT 2260

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Prime Contract	414,695	239,766	342,065
b. Other Government Activities	42,193	61,134	54,440
c. Support Contracts	58,909	58,315	62,984
d. Program Management	19,272	19,420	21,300
e. Targets	11,219	8,354	10,324
f. Lethality	0,000	2,278	5,272
g. OT&E	3,291	1,518	1,367
Total	549,579	390,785	497,752

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
LMMS	CPFF	Oct 97			988,843	384,100	227,566	333,065	42,400	1,975,974
RAYTHEON	CPIF/CPAF	Dec 97			430,035	30,595	12,200	9,000	0,000	481,830
Support and Management Organizations										
SETA	CPAF	Oct 97			67,115	18,204	22,909	24,564	0,000	132,792
Other Spt Cont	Various	Multiple			144,406	40,705	35,406	38,420	0,000	258,937
OGAs	MIPR	Multiple			66,880	26,420	36,435	33,040	0,000	162,775
Program Mgmt	Various	Multiple			48,440	19,272	19,420	21,300	0,000	108,432

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Test and Evaluation Organizations										
WSMR	MIPR	Nov 97			27,531	10,030	22,899	21,400	0,000	81,860
OT&E					1,500	3,291	1,518	1,367	0,000	7,676
TARGETS					61,245	11,219	8,354	10,324	0,000	91,142
LETHALITY					7,182	0,000	2,278	5,272	0,000	14,732

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
JTIDS				13,100	3,788	0,000	0,000	0,000	16,888
Common Eqpt				0,000	0,000	0,000	0,000	0,000	
HEMTT M983				1,024	0,000	0,000	0,000	0,000	1,024
PLS				1,280	0,000	0,000	0,000	0,000	1,280
Testbeds				0,000	0,000	1,300	0,000	0,000	1,300
Miscellaneous				590	1,955	500	0,000	0,000	3,045
Support and Management Property									
N/A				0,000	0,000	0,000	0,000	0,000	
Test and Evaluation Property									

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
N/A				0,000	0,000	0,000	0,000	0,000	
Subtotal Product Development				1,434,872	420,438	241,566	342,065	42,400	2,481,341
Subtotal Support and Management				326,841	104,601	114,170	117,324		662,936
Subtotal Test and Evaluation				97,458	24,540	35,049	38,363		195,410
Total Project				1,859,171	549,579	390,785	497,752	42,400	3,339,687

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Navy Area Missile Defense (Dem / Val)
PE 0603867C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603867C Navy Area

PROJECT: 2263

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2263 Navy Area	157,028	0	0	0	0	0	0	0	763,627

To see the other Program Elements and Appropriations associated with Navy Area TBMD, see section C of this R2.

A. Mission Description and Budget Item Justification

The Navy Area Theater Ballistic Missile Defense (TBMD) project builds on the national investment in AEGIS ships, weapon systems, and Navy Standard Missile II (SM-2) Block IV missiles. Two classes of ships continue to be deployed with the AEGIS combat system: the CG-47 Ticonderoga-class cruisers and the DDG-51 Burke-class destroyers. Navy TBMD will take advantage of the attributes of naval forces including overseas presence, mobility, flexibility, and sustainability in order to provide protection to debarkation ports, coastal airfields, amphibious objective areas, Allied forces ashore, and other high value sites. Navy assets will provide an option for initial TBMD allowing the insertion of additional land-based TBMD assets and other expeditionary forces in a threatening environment.

FY 1997 ($ in Thousands):

- $151,878 Completed systems engineering and analysis and conducted Milestone II Defense Acquisition Board (DAB). Continued development of UOES and tactical computer programs; initiated development of computer program design specifications for the tactical program. Continued detailed missile design. Continued procurement and fabrication of EDM test rounds. Provided technical support for AEGIS weapons system design activities. Continued test planning. Defined interface for TBMD-related upgrades to AEGIS and Joint Maritime Command Information System (JMCIS). Continued Command and Cotrol Processor (C2P) development.
- $5,150 Conducted required lethality analyses, lethality model refinements and testing in support of planned Live Fire Test and Evaluation (LFT&E).
- $157,028 Total

FY 1998 ($ in Thousands):

- $0 No funding in FY 1998
- $0 Total

FY 1999 ($ in Thousands):

- $ No funding in FY 1999
- $0 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY: 4 - Demonstration and Validation	PE NUMBER AND TITLE: 0603867C Navy Area — PROJECT: 2263

Acquisition Strategy: This strategy consists of a Navy Area TBMD Program evolving to a Theater-Wide Defense TBMD program. The Navy Area Program will build on existing force structure by modifying the SM-2 Block IV missile and AEGIS Combat System to achieve TBMD capability.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	59,315	0	0	59,315
FY1999 President's Budget	157,028	0	0	157,028

Change Summary Explanation:

Funding: FY96 Joint Theater Missile Defense target development requirements necessitated a loan of funds, repaid in FY97. FY97 received several miscellaneous OSD-level reductions for inflation adjustments and other OSD requirements, including Bosnia. FY97 was decremented to support Command and Control initiatives supporting the Theater Ballistic Missile Defense Family of Systems. SM-2 Blk IVA design immaturity and delays in the risk reduction flight tests necessitated a program restructure and an FY97 reprogramming from P.E. 0604867C (EMD) to P.E. 0603867C (Dem/Val), as the start of EMD was delayed until February 1997.
Schedule: APB approved February 1997
Technical: None

C. Other Program Funding Summary ($ in Thousands)*

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Complete	Total Cost
Navy Area TMD (EMD) P.E., 0604867C	143,343	278,790	245,796	231,592	160,193	50,296	36,792	Cont	Cont
AEGIS Combat System (Procurement) P.E. 0208867C - BMDO TOA	9,151	15,058	43,318	60,313	72,390	60,214	56,221	Cont	Cont
SM-2 Block IVA (Procurement) P.E. 0208867C -BMDO TOA	0	0	0	65,366	82,644	166,393	159,559	Cont	Cont
SM-2 Block IVA (Procurement) WPN 1507, BA 2 - US Navy TOA	0	0	0	80,292	101,126	126,969	140,499	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603867C Navy Area
	PROJECT 2263

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones:												
- Acquisition Milestone II		*										
- UOES I								X				
Engineering Milestones:												
- AEGIS Combat System (ACS) Preliminary Design Review(PDR)												
- SM-2 BLK IVA PDR												
- ACS PDR (Tactical)					*							
- ACS CDR (Tactical)								X				
T & E Milestones:												
- White Sands Missile Range NM (DT/Operation Assessment)										X		

Milestones Beyond FY 1999

- LRIP Decision	3rdQFY00
- UOES II	4thQFY00
- FUE	1stQFY02
Acquisition Milestone III	2ndQFY02

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603867C Navy Area
	PROJECT 2263

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. System Engineering	29,747	0	0
b. Program Management	3,462	0	0
c. Program Support	2,861	0	0
d. Ship System Modifications	0	0	0
e. Design and Analysis	38,018	0	0
f. Hardware Fab. and Proc.	60,000	0	0
g. Test and Evaluation	11,592	0	0
h. Test Equipment	0	0	0
i. Engineering Support	4,090	0	0
j. Travel	250	0	0
k. Software Development	7,008	0	0
l. Other/Miscellaneous	0	0	0
m. Developmental Test & Evaluation	0	0	0
n. Operational Test & Evaluation	0	0	0
Total	157,028		

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Standard Missile Co.	CPAF				0	81,966	0	0	0	207,674

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603867C Navy Area

PROJECT: 2263

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Lockheed Martin	CPAF				39,407	20,425	0	0	0	94,923
NSWC Dahlgren	WR				14,405	7,292	0	0	0	41,386
JHU/APL	PD				30,928	6,575	0	0	0	58,959
Holoman AFB	MIPR				2,140	0	0	0	0	3,540
Motorola	CPFF				6,162	6,903	0	0	0	25,793
SPAWAR	PD				0	1,955	0	0	0	2,588
Vitro	CPAF				0	2,015	0	0	0	2,015
United Defense	CPFF				0	1,266	0	0	0	1,266
Hughes	CPAF				86,568	0	0	0	0	94,698
Raytheon	CPAF				51,966	0	0	0	0	56,176
Arnold Eng	CPAF				0	0	0	0	0	1,400
Kaman	CPFF				0	0	0	0	0	1,700
ARC	CPFF				0	0	0	0	0	3,400
Miscellaneous (efforts < $500K)					44,794	10,716	0	0	0	57,320
Support and Management Organizations										
NSWC Dahlgren	WR				3,813	530	0	0	0	13,234
NSWC Port Hueneme	WR				220	0	0	0	0	588
NAWC China Lake	WR				0	1,000	0	0	0	3,354
NSWC Indian Head	RCP				0	505	0	0	0	2,048
VITRO	CPFF				3,500	490	0	0	0	6,390
SPA	CPFF				0	500	0	0	0	1,242
TSC	CPFF				0	900	0	0	0	4,873
NAVSEA	PD				0	1,000	0	0	0	1,000
Hanscomb AFB	MIPR				0	0	0	0	0	1,500

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603867C Navy Area						PROJECT 2263
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Miscellaneous (efforts < $500K)					6,022	1,398	0	0	0	10,077
Test and Evaluation Organizations										
NAWC Point Mugu	WR				5,018	875	0	0	0	7,284
NSWC Port Hueneme	WR				880	910	0	0	0	2,040
NSWC Dahlgren	WR				5,800	5,559	0	0	0	11,689
JHU/APL	WR				0	0	0	0	0	1,483
SSDC Army	MIPR				7,534	200	0	0	0	12,955
WSMR	WR				3,250	600	0	0	0	9,431
PMRF	WR				0	545	0	0	0	3,410
Arnold Eng.	CPFF				0	650	0	0	0	650
Holloman AFB	MIPR				0	200	0	0	0	200
NWAD Corona	WR				0	0	0	0	0	1,000
Miscellaneous (efforts < $500K)					12,628	2,053	0	0	0	16,341

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603867C Navy Area

PROJECT: 2263

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development				276,370	139,113	0	0	0	652,838
Subtotal Support and Management				13,555	6,323	0	0	0	44,306
Subtotal Test and Evaluation				35,110	11,592	0	0	0	66,483
Total Project				325,035	157,028	0	0	0	763,627

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Navy Theater Wide Missile Defense (Dem / Val)
PE 0603868C

mj-65946 / 081496

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1266 Navy Theater Wide	304,171	419,414	190,446	186,144	183,258	139,273	144,357	Continuing	Continuing

A. Mission Description and Budget Item Justification

The requirement for the Navy Theater Wide (NTW) Theater Ballistic Missile Defense (TBMD) system is to provide protection to U.S. and allied forces against medium to long range theater ballistic missiles (TBMs). This protection includes those political and military assets designated as vital to U.S. interests. NTW will provide an effective defense when the ship is positioned near the enemy TBM launcher to effect ascent phase intercepts; along the TBM trajectory as the TBM passes over water or inland along the coast to effect midcourse intercepts; and, near the defended area to provide descent phase intercepts and achieve an additional layer of defense for lower-tier TBMD systems.

The NTW system builds upon the existing AEGIS Weapons System (AWS) and the STANDARD Missile (SM) infrastructure as a further evolution to the Navy Area TBMD system. The AWS (as modified for Navy Area TBMD) will be evolved to support exoatmospheric ascent, mid-course, and descent phase engagements. The Navy STANDARD Missile - 2 Block IV will be modified to accommodate a kinetic warhead (KW), a new third stage propulsion system, and exoatmospheric guidance. The new variant of the STANDARD Missile is the STANDARD Missile - 3 (SM-3).

The 1995-1996 Ballistic Missile Defense Program Review, implemented by the FY1997 PBD-224 of February 10, 1997, directed the NTW TBMD program to conduct interceptor concept definition studies and technology demonstrations to confirm the interceptor solution. Further, the Ballistic Missile Defense Organization (BMDO) and Navy were directed to proceed to a system level intercept employing the AWS (including the STANDARD Missile and Vertical Launch System) with the Lightweight Exoatmospheric Projectile (LEAP) Kinetic Warhead. The interceptor concept study is scheduled to be briefed at the 1998 DAB Review. The FY1997 PBD-224 directed technology demonstration is called the Flight Demonstration Program/AEGIS LEAP Intercept (FDP/ALI). The FDP/ALI is being executed by the Navy Program Executive Office for Theater Air Defense (PEO(TAD)). The FDP/ALI will provide integration of the SM-3/Kinetic Warhead into the AWS. The NTW FDP/ALI schedule provides for two Control Test Vehicle (CTV) and seven Flight Test Round (FTR) flights to be conducted aboard U.S. Navy AEGIS combatants from the Pacific Missile Range Facility (PMRF). The initial intercept for the ALI program is scheduled for FY1999.

For the past three years (1995, 1996 and 1997), Congress has increased NTW funding levels to accelerate the development and deployment of this critical capability. The FY1997/98 Congressional plus-up allowed for additional FDP/ALI flight tests and expanded the risk reduction activities to support the FDP/ALI transition to a tactical NTW capability.

On December 3, 1996, the Under Secretary of Defense for Acquisition and Technology (USD(A&T)) directed that the NTW program be included in the Theater Missile Defense "core program" as that term was used in the 1993 Bottom-Up Review. Further, the letter directed the BMDO and the Navy to implement the Integrated Product Team (IPT) process to make recommendations on the appropriate phase for NTW to enter the acquisition cycle, the associated required

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documentation, and program schedule. In response to the letters' direction, the Overarching Integrated Product Team (OIPT) recommended, and the USD(A&T) approved, the following for the DAB Review scheduled for March 1998:

- The NTW program will enter at Program Definition and Risk Reduction (Phase I);
- The Milestone Schedule of MSII in FY03, MSIII in FY07, First Unit Equipped in FY08; and,
- The list of required program documentation.

The NTW Program was declared an Major Defense Acquisition Program, ACAT 1D, on September 16, 1997.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

FY 1997 ($ in Thousands):

–	$285,762	Continued Vertical Launch System (VLS) integration and engineering of the NTW SM-3 missile. Continued engineering for the NTW regional defense program and continue specific concept investigations and technology demonstrations. Conducted kill vehicle technology assessments and shipboard system risk reduction activities. Continued NTW TBMD planning and studies, and continued Navy COEA Phase II. Continued AEGIS Weapon System integration for an NTW interceptor and provide limited AWS integration to support the GTH demonstration flights.
–	$10,552	Initiated building of TBM representative targets to support NTW flight demonstration program.
–	$4,548	Explored NTW application of advanced technologies through the Small Business Innovative Research (SBIR) Program.
–	$3,309	Continued follow-on engineering and analysis to support NTW.
–	$304,171	Total

FY 1998 ($ in Thousands):

–	$389,208	Continue ALI system engineering, test article procurement, program management, risk reduction activities and test and evaluation. Continue preparation and conduct a Defense Acquisition Board (DAB) Review. Complete Navy COEA Phase II.
–	$16,744	Continue targets and initiate PMRF range upgrades to support NTW test and evaluation.
–	$4,347	Continue to explore NTW application of advanced technologies through the Small Business Innovative Research (SBIR) Program.
–	$7,700	Continue lethality requirement definition support and lethality performance testing of NTW KW.
–	$1,415	Continue follow-on engineering and analysis to support NTW.
–	$419,414	Total

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FY 1999 ($ in Thousands):

- $167,401 Continue ALI system engineering, test article procurement, program management, and test and evaluation.
- $7,000 Continue lethality requirement definition support and lethality performance testing of NTW KW.
- $16,045 Continue targets support to NTW test and evaluation.
- $190,446 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	304,171	194,898	192,073	691,142
Appropriated Value		409,898		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-15,484		
b. Internal Realignments				
c. Other Adjustments (Navy Reprogramming)		+25,000		
FY1999 President's Budget	304,171	419,414	190,446	914,031

Change Summary Explanation:

Funding:

FY98: Changes reflect congressional language adding funds for additional risk reduction efforts and undistributed general reductions.

FY99: Changes reflect general reductions for revised inflation estimates.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2263, Navy Area TBMD, PE 0603867C	157,028	0	0	0	0	0	0	0	763,627
2263, Navy Area TBMD, PE 0604867C	143,343	278,790	245,796	231,592	160,193	50,296	36,792	Cont	Cont

D. Schedule Profile

FY 1997				FY 1998				FY 1999			
1	2	3	4	1	2	3	4	1	2	3	4

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Third Stage Rocket Motor Test			-	*	X							
Control Test Vehicle 1 Flight				*								
Complete Navy TBMD COEA Phase II					*							
DAB Review						X						
Kinetic Warhead Hover Test								X				
Target Test Vehicle Flight								X				
Control Test Vehicle 2 Flight								X				
Flight Test Round 1 Flight											X	
Flight Test Round 2 Flight												X
Flight Test Round 3 Flight												X

Schedule Profile (Beyond FY 1999)

Flight Test Round 4 Flight: 3QFY00
Flight Test Round 5 Flight: 4QFY00
Flight Test Round 6 Flight: 1QFY01
Milestone IIA: FY03
Milestone IIB: FY06
First Unit Equipped (Block I): FY06
Flight Test Round 7 Flight: 2QFY01

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. System Engineering	23,467	48,905	12,924
b. Program Management	9,016	11,691	5,693
c. Program Support	5,361	6,952	3,385
d. Ship System Mods	12,684	16,447	7,161
e. Design & Analysis	129,613	141,156	43,464
f. Hardware Fab & Procurement	59,900	106,746	55,491
g. Test & Evaluation	19,608	45,864	30,203
h. Test Equipment	10,552	10,570	16,045
I. Engineering Support	9,745	12,636	5,752
j. Travel	300	300	300
k. Software Development	20,616	16,732	10,028
l. Other/Misc/BMDO	3,309	1,415	0
Total	304,171	419,414	190,446

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Standard Missile Company	CPAF				53,131	173,128	205,626	103,253	TBD	620,108
Lockheed Martin	CPAF				12,637	30,152	63,677	13,913	TBD	137,179
NSWC Dalgren	WR				6,109	13,395	17,288	3,729	TBD	60,760

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
JHU/APL	RCP				3,295	13,700	8,963	4,780	TBD	40,411
Holloman AFB/MIT-LL	MIPR				8,794	7,000	10,580	3,000	TBD	30,094
SSI	CPFF				1,576	882	980	1,000	TBD	5,390
United Defense	PD				0	2,000	4,635	1,350	TBD	10,660
Phillips Lab	CPAF				0	1,500	770	950	TBD	4,162
Arnold Eng	CPFF				0	100	150	300	TBD	850
Raytheon	CPFF				0	500	500	435	TBD	1,870
TSC	CPFF				0	800	1,600	575	TBD	5,125
Misc					12,640	5,519	3,153	1,832	TBD	25,807
BMDO					47,990	3,309	1,415	0	TBD	90,686
Competitive							25,000			25,000
Support and Management Organizations										
NSWC Dahlgren	WR				0	5,684	4,932	1,450	TBD	14,066
NSWC Port Hueneme	WR				0	1,565	2,822	2,100	TBD	7,302
NAWC China Lake	WR				0	4,973	2,771	1,400	TBD	10,544
NSWC Indian Head	RCP				0	1,387	1,000	650	TBD	5,407
VITRO	CPFF				2,132	535	357	490	TBD	3,959
SPA	CPFF				0	150	1,953	863	TBD	3,466
JHU/APL	CPFF				0	1,500	2,270	825	TBD	8,748
Misc					2,589	6,692	2,538	1,300	TBD	14,615
Test and Evaluation Organizations										
NSWC Dalgren	WR				0	9,610	6,585	**10,658**	TBD	30,653
JHU/APL	CPFF				0	800	700	1,150	TBD	3,050
SSDC Army	MIPR				0	10,552	35,778	**19,443**	TBD	67,049

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BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603868C Navy Theater Wide

PROJECT: 1266

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
WSMR	WR				1,198	166	50	150	TBD	1,614
NAWC/PHD	WR				0	1,350	1,697	1,850	TBD	4,897
PMRF	WR				0	4,468	6,174	0	TBD	10,642
MANTECH	CPFF				0	0	1,680	1,500		3,180
Misc					3,909	2,754	3,770	11,500	TBD	23,179

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
TBD									
Support and Management Property									
TBD									
Test and Evaluation Property									
TBD									
Subtotal Product Development				146,172	251,985	344,337	135,117		1,058,102
Subtotal Support and Management				4,721	22,486	18,643	9,078		68,107
Subtotal Test and Evaluation				5,107	29,700	56,434	46,251		144,264
Total Project				156,000	304,171	419,414	190,446		1,270,473

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Medium Extended Air Defense System (MEADS) (Dem / Val) (Corps SAM) PE 0603869C

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1262 MEADS Concepts	58,825	46,144	43,027	0	0	0	0	0	169,019

A. Mission Description and Budget Item Justification

The Medium Extended Air Defense System (MEADS) is an advanced air and missile defense system. MEADS is designed to fill a critical void by providing highly mobile defense of maneuver forces from ballistic and cruise missiles and unmanned aerial vehicles (UAVs). In May 1996 the Memorandum of Understanding (MOU) among the U.S., Germany, and Italy was signed. Subsequently, in June 1996, the Charter for the North Atlantic Treaty Organization (NATO) MEADS Design and Development, Production, and Logistics Management Organization (NAMEADSMO) was approved. In accordance with these directives, the NATO MEADS Management Agency (NAMEADSMA) is responsible for the accomplishment of the Project Definition-Validation (PD-V) Phase. The objective of the PD-V Phase is 1) to define and validate through engineering analyses, simulations and demonstrations a MEADS which is compliant with the commonly agreed requirements of the participants while taking maximum advantage of the technology existing in the countries of the participants and 2) to define a balanced cooperative program to develop, produce in single source, and support MEADS which has acceptable technical and financial risks for the participants. The MEADS Product Management Office has also been established and will be responsible for planning, budgeting, and coordinating all U.S. national efforts in support of the MEADS program as well as executing national specific tasks related to satisfying the MEADS requirements.

The MEADS mission and consequently its design is a function of the assets that MEADS must protect, the threat against these assets, and the depth and nature of the battlefield. MEADS will be designed to deal with shorter range Tactical Ballistic Missiles (TBMs), cruise missiles, UAVs, and other threats within the atmosphere. It will be required to protect critical maneuver force assets throughout all phases of tactical operations and it will be operating in the division area of the battlefield outside the umbrella of an upper tier defense system. MEADS will be designed to provide: 1) defense against multiple and simultaneous attacks by Short Range Ballistic Missiles (SRBMs), low radar cross-section cruise missiles, and other air-breathing threats; 2) rapid deployment of a minimum battle element that is C-130 transportable; 3) mobility to move rapidly and protect maneuver force assets during offensive operations; 4) a distributed architecture and modular components to increase survivability and flexibility of employment in a number of operational configurations; 5) a significant increase in firepower while greatly reducing manpower and logistics requirements. Given these characteristics, MEADS will be able to rapidly respond to a variety of crisis situations and satisfy the needs of the joint operational and tactical commanders.

FY 1997 ($ in Thousands):

- $47,500 Prime contracts for PD-V Phase.
- $4,990 Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BM/C4I, system simulations, FAAD/MEADS integration) and support in conducting independent evaluations of contractor trades and analysis.

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- $6,335 Overall management to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V and to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, Cost and Operational Effectiveness Analysis (COEA), etc.). Includes all U.S. personnel salaries and benefits.
- $58,825 Total

FY 1998 ($ in Thousands):

- $35,210 Prime contracts for PD-V Phase.
- $5,270 Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BM/C4I, system simulations, FAAD/MEADS integration), support in conducting independent evaluations of contractor trades and analysis, and provide additional technical analysis of contractor competitive proposals for Design and Development (D&D).
- $5,664 Overall management to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V and to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, Cost and Operational Effectiveness Analysis (COEA), etc.). Includes all U.S. personnel salaries and benefits.
- $46,144 Total

FY 1999 ($ in Thousands):

- $30,690 Prime contractors complete PD-V Phase and selected contractor initiate pre-Design and Development.
- $5,737 Support contracts to provide technical analysis and tools in specialty areas (e.g. lethality, BMC4I, system simulations, FAAD/MEADS integration), support in conducting independent evaluations of contractor trades and analysis, and provide additional technical analysis of contractors competitive proposals for D&D.
- $6,600 Overall management to execute the cooperative program in accordance with the NATO Charter and MOU for PD-V and to conduct assigned tasks in support of and directly related to both national and MEADS international efforts (e.g. user coordination, national oversight and review activities, technology transfer, and technology assessment efforts; threat/scenario, modeling/simulation, cost estimating, Cost and Operational Effectiveness Analysis (COEA), etc.). Includes all U.S. personnel salaries and benefits.
- $43,027 Total

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Acquisition Strategy

The MEADS acquisition strategy was developed based on having two competitive transatlantic industrial teams conduct the PD-V phase in which technology among the nations would be leveraged to define the most cost-effective solution to meet the requirements. In Oct 95, following a formal U.S. source selection process, the U.S. Army announced the selection of Lockheed-Martin Integrated Systems, Inc. and H&R Company (joint venture between Hughes Aircraft and Raytheon Company) as U.S. industrial participants. Following a random selection process, each team was paired with a European team with the goal of creating two equal transatlantic industrial entities. Both European teams consist of the following firms: Alenia, DASA, and Siemens. Contracts to conduct a four month international industrial teaming phase were awarded on 1 May 96. Following the teaming phase, the international teams were awarded two contracts on 4 Oct 96 to execute PD-V. During PD-V the contractors will be required to define/develop a total system concept based upon the International Technical Requirements Document; conduct requirements analysis/flowdown; establish baseline system concept; conduct concurrent engineering design trades; perform simulations/modeling; provide life cycle cost estimates; and establish integrated program plans to include a risk assessment/abatement plan. The effort will also include demonstration of critical functions associated with integrated system performance and resolution of key technical issues for the proposed system design concept through use of end-to-end digital simulation. Also, during the PD-V phase the two international entities will compete for selection as the sole contractor to conduct the D&D and Production phases. The MEADS Product Management Office is pursuing integration of MEADS BMC4I with the Project Manager, Air Defense Command and Control Systems (ADCCS), to take advantage of previous Army developments that can be incorporated into the MEADS program.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY 1998/1999 President's Budget	56,232	47,956	9,509	113,697
Appropriated Value		47,956		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,812		
b. Internal Realignments		0		
FY 1999 President's Budget	58,825	46,144	43,027	147,996

Change Summary Explanation:

Funding: FY 1998 (-1,812): Project decremented for General Reductions.
FY99: Increase per Mission Realignment based on the QDR.

Schedule: None.

Technical: None.

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This project was funded under PE 0603216C Project 2212 prior to FY 95, PE 0603869C Project 2262 in FY 95, and PE 0603869C Project 1262 in FY 96 and beyond.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
Missile Procurement, Army, SSN C53000*							56,300	CONT	CONT

*Army Total Obligation Authority

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Engineering Milestone:												
System Requirements Review				*								
System Design Review							X					
Contract Milestone:												
Int'l Teaming Contract Award												
PD-V Contract Award	*											
Release RFP for Design and Dev							X					
Complete PD-V												X
Initiate D&D Bridge Contract												X
Other Program Events:												
Rqmts Harmonization w/GE/IT												
Sign MOU												
Establish NATO Agency												
Conduct SC Review1												
Conduct SC Review2												
Conduct SC Review3												

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Conduct SC Review4	*											
Program Initiation Ceremony	*											
DAB-Level Review			*									
Conduct SC Review5			*									
Initiate AOA				*								
D&D DAB									X			

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A. Project Cost Breakdown ($ in Thousands)

Project Cost Category	FY 1997	FY 1998	FY 1999
MEADS Concepts	58,825	46,144	43,027
Total	58,825	46,144	43,027

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Lockheed Team	FFP	May-96	5,533	5,533	0	0	0	0		5,533
Raytheon Team	FFP	May-96	4,072	4,072	0	0	0	0		4,072
Project Def/Val/ Pre-D&D	FFP	Oct-96	119,000	119,000	0	47,500	35,210	30,690		119,000
Support and Management Organizations										
NAMEADSMA	MEADS LLC		16,397	16,397	0	4,990	5,270	5,737		16,397
NAMEADSMA/ U.S. PMO	Admin/IOB		24,017	24,017	0	6,335	5,664	6,600		23,117
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
TBD									
Support and Management Property									
TBD									
Test and Evaluation Property									
TBD									
Subtotal Product Development					47,500	35,210	30,690		128,605
Subtotal Support and Management					11,325	10,934	12,337		39,514
Subtotal Test and Evaluation									
Total Project					58,825	46,144	43,027		168,119

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Boost Phase Interceptor
PE 0603870 C

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1294 UAV Boost Phase Intercept	22,755	15,766	0	0	0	0	0	TBD	TBD

A. Mission Description and Budget Item Justification

The Unmanned Aerial Vehicle (UAV)-Based Boost Phase Intercept (BPI) project covers two tasks; Task 1: Israeli Boost Phase Intercept System (IBIS) Risk Mitigation, and Task 2: Cooperative UAV-Based BPI Concepts. Task 1 is a cooperative U.S./Government of Israel (GOI) BPI program which involves further development and refinement (risk mitigation) of the UAV-based BPI concept which destroys tactical ballistic missiles in the boost phase of flight, before engine cutoff, preferably while in enemy territory. This project is based on the use of UAVs armed with on-board interceptors to provide the means of destroying enemy missiles in their boosting phase of flight. Task 1 efforts will be performed in Israel and will focus on key elements of the IBIS concept. Task 2 of this cooperative effort will be performed in the U.S. and will support and expand key elements of the IBIS concept. It will include developing the UAV-based BPI system requirements for scenarios of operation and employment in support of U.S. expeditionary forces. The requirements will address, development of search and track sensors, Battle Management, Command, Control, Communications, Computers and Intelligence (BMC4I), and a concept of operations (CONOPS) based on readily available U.S. technologies.

Along with attack operations, the BPI concept is a means of destroying hostile ballistic missiles in enemy territory. UAVs armed with interceptors show significant near term promise. Previous cooperative investigations of the UAV-based BPI concept and a recent Air Force Airborne Laser (ABL) Analysis of Alternatives (AoA) study concluded that such a BPI system could be very cost effective and complementary to terminal missile defense systems.

FY 1997 ($ in Thousands):

- $18,040 Initiated risk mitigation activities with the GOI. Emphasized development of key lightweight interceptor seeker and control system technologies, search and track algorithms, fire control algorithms, and simulation of BMC4I technologies.
- $1,110 Validated UAV-based BPI system performance parameters through simulations and wargaming.
- $3,605 Analyzed technical issues including survivability, interceptor effectiveness, and development of an Infrared Search & Track Sensor (IRST).
- $22,755 Total

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FY 1998 ($ in Thousands):

- $5,750 Initiate development of and demonstrate a prototype search, launch detection, tracking and discrimination capability
- $7,663 Demonstrate, via simulations key IBIS performance and command and control parameters. Further refine interceptor design.
- $2,353 Develop a proof-of-concept /technology road map.
- $15,766 Total

FY 1999 ($ in Thousands):

- $0 Project continuation decision and funding is addressed under PE 0603875C International Cooperative Programs.
- $0 Total (see PE 0603875C)

Acquisition Strategy: This program is a "hedge" risk mitigation effort for the ABL program and can provide complementary support to the ABL. This program will conduct cooperative activities in the U.S. and Israel to mitigate risk of developing UAV-based BPI systems. The GOI will take the lead on risk mitigation of the interceptor while the U.S. will lead for the Infrared Search and Track (IRST) sensor activities. In other system elements, such as BMC4I and system integration, responsibilities will be shared. The US and GOI will share costs on a 75/25 percent ratio for Task 1 being done under a firm fixed price contract with Israeli industry. Task 2 is being accomplished by BMDO/Service Integrated Product Teams (IPT) with additional support provided by industry.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	23,276	12,885	0	36,161
Appropriated Value		16,385		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc,)		-619		
c. Internal Realignments				
FY1999 President's Budget	22,755	15,766	0	38,521

Change Summary Explanation:

Funding: None
Schedule: None
Technical: None

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C. **Other Program Funding Summary ($ in Thousands)**

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1294 UAV BPI, PE0603872C	930							0	6,635

D. **Schedule Profile**

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Preliminary US UAV BPI Requirements		X										
Contract Milestone (Israeli) Risk Mitigation			X									
IBIS Risk Mitigation Final Report											X	
Contract IRST Effort						X						
IRST Final Report												X
Deliver IRST HW to Israel												X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
IBIS Risk Mitigation	18,040	7,663	see
Cooperative UAV-based BPI Concepts	4,715	8,103	PE 603875C
Total	22,755	15,766	

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Israeli MOD	FFP	Jun 97	25,703	25,703	0	18,040	7,663	0	TBD	25,703
SMC	MIPR	FY96	0	0	N/A	130	0	0	TBD	130
Navy PEO TAD	MIPR	FY97/98	1,520	1,520	N/A	800	250	0	TBD	1,050
ONR/NAWC-CL	CPFF	FY97/98	8,000	8,000	N/A	2,750	5,000	0	TBD	7,750
DARPA	MIPR	FY96	0	0	N/A	150	0	0	TBD	150
Support and Management Organizations										
WJ Schaefer Assoc	CPFF	FY97/98	922	922	N/A	420	150	0	TBD	570
SSDC	MIPR	FY96	0	0	N/A	0	0	0	TBD	
SMC	MIPR	FY97	250	250	N/A	0	0	0		
NAWC-CL	CPFF	FY97/98	635	635	N/A	135	500	0		635
Anser	CPFF	FY98	1,411	1,411	N/A	250	2,203	0	TBD	2,453
Test and Evaluation Organizations										

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
USAF/WL/MNGI	CPFF	FY97	80	80	N/A	80				80

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					21,870	12,913			34,783
Subtotal Support and Management					805	2,853			3,658
Subtotal Test and Evaluation					80				80
Total Project					22,755	15,766			38,521

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National Missile Defense (NMD) (Dem / Val)
PE 0603871C

mj-50080A / 081496

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2400 Ational Missile Defense [Multi-Projec	811,416	941,142	950,473	864,435	664,930	359,444	313,406	Continuing	Continuing

A. Mission Description and Budget Item Justification

The goal of the NMD program is to develop, within three years, elements of an initial NMD system that could be deployed within three years of a deployment decision. This approach, commonly referred to as the NMD "3+3" program, includes: providing a near-term focus to reduce program risk; providing a hedge against the potential of more sophisticated emerging threats; and conducting an integrated NMD system test not later than FY99. The intent of the NMD Program is to position the U.S. to respond to a strategic missile threat as it emerges. If no threat materializes at the end of the three year development period, development will continue and the program will maintain a capability to deploy within three years after a decision is made to do so. With this approach, no commitment to deploy is made until the threat emerges.

In May 1997, the Department completed a Quadrennial Defense Review (QDR) to ascertain current world threats, develop present and future over-arching strategies, and define required military capabilities and policies. For the NMD Program, the findings of this review resulted in a re-affirmation and commitment to the NMD "3+3" Program. Additionally, the QDR recommended and OSD adjusted NMD Funding (FY99-FY02) to enable NMD development to respond to projected threats. An additional $474M for the NMD program was recommended by the QDR for FY98 and subsequently appropriated by Congress. In August 1997, USD (A&T) approved the NMD program's acquisition strategy, including the Cost as an Independent Variable (CAIV) approach (to be updated after the contract award for the Lead System Integrator), the NMD Acquisition Program Baseline (APB), and the release of the LSI Execution Phase Request-for-Proposal (RFP).

Beginning in FY99, a new Program Element, BMD Technical Support (0603874C, or XB), will be created and includes all NMD/TMD common projects and tasks funded in the NMD program. This change affects the following NMD mission common projects: 1155 (Phenomenology), 3153 (Systems Architecture and Engineering), 3270 (Threat and Countermeasures), 3352 (Modeling and Simulation), 3353 (Joint National Test Facility), and 3360 (Test Resources).

A central feature of the NMD Program strategy is the awarding of a contract for an NMD Lead Systems Integrator (LSI). The objective of this approach is to have a single contractor, executing under government direction, who will be charged with the contractor accountability to design, develop, test, integrate and potentially deploy a NMD system. Two Concept Definition contracts were awarded in FY97, and downselect to a single LSI contractor is scheduled for 2Q/98. The single LSI contractor will integrate all existing NMD element development activities and initiate development of other elements as necessary. With government approval, the LSI contractor will have the latitude to modify current NMD development programs (e.g., GBI, GBR, etc.). As such, the details of these programs described herein may change starting in FY98, pending the selection of the LSI contractor.

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The NMD system is composed of several elements which are required to perform the key functions involved in a ballistic missile defense engagement. The Ground Based Radar (GBR) and the Space Based Infrared System - Low (SBIRS Low) provide the dual sensor phenomenology required to address the full spectrum of potential threats. In addition, Upgraded Early Warning Radars (UEWR) are candidate sensors in the event of an early NMD deployment. SBIRS Low, which will provide midcourse tracking of targets, is currently managed and funded by the Air Force as part of the Space Based Infrared System (SBIRS). The Ground Based Interceptor (GBI) is the weapon element that engages and destroys the threat. The Battle Management/Command, Control, and Communications (BM/C3) element provides engagement planning and execution, human-in-control of the NMD system, and interfaces with external C3 systems.

In addition, several related activities are being performed in support of the NMD Program. System Engineering develops the NMD system-level performance and integration requirements and flows these requirements down to the individual elements. Ultimately, the accomplishment of system-level performance and integration requirements will become the responsibility of the NMD LSI contractor. Deployment Planning activities focus on the planning required to field the NMD system. Test and Evaluation activities provide infrastructure and management of the NMD Test and Evaluation program. Program Support maintains NMD Joint Program Office (JPO) operations. Other NMD Initiatives include studying alternative test sites for NMD as directed by Congress. Each of these major NMD activity areas is described further below.

NMD INTEGRATION activities focus on using a single contractor to develop and integrate the individual NMD elements into a cohesive NMD system. This LSI contractor will assist the government in: 1) evolving from individual element technology development to an open, integrated system development ready for deployment; 2) moving from total government integration to contractor responsibility; 3) planning, designing, and developing an open NMD system that will meet system requirements; 4) conducting a successful FY99 integrated system test followed by a Deployment Readiness Review; 5) developing and maintaining a viable three year NMD system deployment option; and, 6) providing and maintaining flexibility to deploy or continue to improve and test the NMD system.

SENSOR TECHNOLOGY includes research and development efforts for critical sensor components which support infrared surveillance, acquisition, tracking, and discrimination functions to be used in the SBIRS Low system. Projects in radiation hardened electronics and spacecraft computers, focal plane arrays (FPAs), long-life cryogenic coolers, signal/data processing and optics are developing the state-of-the-art technologies essential to operating in a space environment and viewing targets against the earth limb and space backgrounds. FPAs developed under this effort are designed to operate down at the low background noise levels and are tested for applicability to NMD sensor systems. Cryocoolers are being developed to support the FPA technologies. Optical components and electronic components are developed for SBIRS Low applications and tested for performance, reliability and any degradation due to environmental effects of space such as radiation and contamination.

The GROUND BASED INTERCEPTOR will demonstrate the NMD interceptor capability, with an emphasis on accomplishing the NMD integrated system test in FY99. The initial focus of GBI development is the exo-atmospheric kill vehicle (EKV) which is the most critical and technically challenging part of the GBI. Until booster development is complete, EKV flight tests will be flown on the Payload Launch Vehicle (PLV), which is a booster consisting of a Minuteman II second and third stage. An EKV sensor flight test was successfully accomplished in FY97, and a second sensor flight test is scheduled for FY98. EKV interceptor flight tests are scheduled for FY98 and FY99.

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The BATTLE MANAGEMENT, COMMAND, CONTROL AND COMMUNICATIONS element incrementally prototypes the BM/C3 functionality required for the NMD mission, and integrates and demonstrates an NMD system in step with evolving NMD sensors and interceptor element capabilities. BM/C3 incremental prototypes will be integrated and demonstrated at the Joint National Test Facility (JNTF) with user participation to refine and focus the BM/C3 development and system behavior. NMD BM/C3 supports the NMD command and control process required to provide human-in-control; develops, assesses, and selects missile defense strategies and tactics; fuses and correlates available sensor information; integrates and plans the complimentary coordination of NMD sensors and interceptors for maximum system performance; supports kill assessment; provides interface with existing and planned C3 systems; and prototypes an In-flight Interceptor Communications System (IFICS) for BM/C3-GBI communication.

GROUND BASED RADAR is the primary fire control sensor, providing surveillance, acquisition, tracking, discrimination, fire control support and kill assessment for the NMD system. The GBR leverages from the Theater Missile Defense Ground Based Radar program. A GBR prototype, designated as GBR-P, will be installed at USAKA in FY98 and will be available as part of the FY99 NMD integrated system test (IFT-5).

UPGRADED EARLY WARNING RADARS incorporate the software upgrades and modest hardware changes required by the existing Early Warning Radars to support the NMD mission. The UEWRs will detect, track and count the individual objects in a ballistic missile attack early in their trajectory. The UEWR data can be used for interceptor commit and other X-band radar cueing in an early NMD architecture.

SYSTEM ENGINEERING develops the NMD system-level performance and integration requirements as derived from the CRD, ORD, and CONOPs, and flows them down to the NMD system and individual NMD elements. In addition, the systems engineer plans and directs command and control simulations (C2Sims) where analyses, simulations, and tests are performed to address the system effectiveness and concept of operations of proposed NMD system architectures against near and far-term ballistic missile threats. The systems engineer develops the functional definitions of the candidate deployment options needed to meet user requirements, and as such manages all interactions with USSPACECOM in areas relating to requirements. This project is responsible for the development of mission, threat, performance, survivability, and effectiveness analysis of the candidate defense system architectures. Accomplishment of system-level performance and integration requirements become the responsibility of the NMD Lead Systems Integrator (LSI) contractor. As element development matures with the LSI, the focus of the Systems Engineer will remain on the system-level balancing, verification, and validation of the integrated system performance of the NMD system. The Systems Engineer is the NMD focal point-of-contact to conduct special studies as requested by OSD, BMDO, and external agencies to support treaty analysis, policy guidance, and other NMD derivative missions.

DEPLOYMENT PLANNING activities focus on the planning and logistics required to field a NMD system. This includes identifying the critical actions and timelines for fielding an NMD system to reduce the timeline and risks inherent in such a deployment. In addition, this effort includes development of environmental analyses and documentation, siting analyses, facilities assessment, modification, refurbishment and meeting other beneficial occupancy issues.

TEST AND EVALUATION activities involve managing and overseeing the NMD test and evaluation program. This oversight ensures that test infrastructure (including test ranges and instrumentation, test beds for HWIL and modeling and simulation activities, and development of targets for sensor tests and intercepts) is available when needed. Management activities include development of the NMD Test and Evaluation Master Plan (TEMP) in accordance with the T&E strategy and

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approval of the Integrated Test Plan, and Detailed Test Plans and Post-Test Analysis Plans for each ground and flight test. Post-test evaluation, analysis, review and reporting is also provided under this activity.

OTHER NMD INITIATIVES includes studying alternative test facilities for NMD as directed by Congress, and supports incorporation of Air Force operational tests into the NMD test program for risk reduction purposes.

DISCRIMINATION provides the U.S. with the capability to generate high confidence target signatures for ballistic missile defenses. This is a critical adjunct to the design and evaluation of NMD system performance across the full spectrum of threats and engagement scenarios. This program provides signature collection sensors for live-fire missions and storage of the resulting test data. This program provides predictive models of target signatures and develops algorithms for the critical functions of discrimination, target handover and aimpoint selection.

SYSTEMS ARCHITECTURE AND ENGINEERING supports an initiative to ensure that joint systems architecture/engineering are addressed in a coordinated and synergistic manner across all NMD and TMD efforts. Systems analysis work is done to determine the expected operational effectiveness and life cycle cost impacts of the NMD system based on changing threats, mission requirements, acquisition reform initiatives and advances in technology. It includes implementation within BMDO of DoD initiatives in architectures, systems engineering, and open systems.

THREAT AND COUNTERMEASURES defines potential adversary missile forces which the NMD system could confront. This includes 1) Intelligence threat description in the form of an annual report, the NMD System Threat Assessment (NMD STA); 2) Threat scenario generation; and 3) Countermeasure integration, which integrates countermeasures (CM) technology into NMD elements.

MODELING AND SIMULATION ensures timely availability of reliable, cooperative, and cost-effective BMDO and Service-provided Modeling, Simulation, & Networks (MS&N) tools and capabilities responsive to BMDO requirements. This project provides for the planning, coordination, program management, and technical oversight of system level M&S for TAMD and NMD Programs. MS&N programs funded by this NMD project include: Wargame 2000, M&S Roadmap, Mission Oriented Information Technology Resources (ITR), BMDO Data Centers, BMD Virtual Data Center (VDC), the BMD Simulation Support Center (SSC), and the infrastructure portion of the Advanced Research Center/Simulation Center (ARC/SC) and the Joint Missile Defense Network (JMDN) that supports the capability to interoperate in a distributed integrated simulation (DIS) environment.

TEST RESOURCES provides the infrastructure to support the NMD test and evaluation program. Test infrastructure includes common test ranges and instrumentation, and common test beds for NMD HWIL testing and simulation activities. Common ground test facilities include: Kinetic Kill Vehicle Hardware-in-the-Loop Simulator (KHILS) at Eglin AFB, FL; Hypervelocity Wind Tunnel Number 9 at the Naval Surface Warfare Center, White Oak, MD; National Hover Test Facility (NHTF) at Edwards AFB, CA; Kinetic Energy Weapon Digital Emulation Center at Huntsville, AL; Aero optic Evaluation Center (AOEC) at Calspan Corp, Buffalo, NY; Center for Research Support (CERES) at Falcon AFB, CO; Army Missile Optical Range (AMOR) at Huntsville, AL; 7V and 10V chambers at Arnold Engineering Development Center (AEDC) in Tullahoma, TN; Portable Optical Sensor Tester (POST) and Characterization of Low Background Mosiacs (CALM) at Rockwell International in Anaheim, CA; Naval Research and Development (NRaD) at the Naval Command, Control and Ocean Surveillance Center in San Diego, CA;

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and infrared and blackbody standards at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD. Common range facilities include Kwajalein Missile Range (KMR) in the Marshall Islands; Western Range (WR) at Vandenberg AFB, CA; and the Pacific Missile Range Facility (PMRF) at Kauai, HI. Common range instrumentation includes special test equipment, data collection assets and range instrumentation upgrades including: High Altitude Observatory (HALO) with the Infrared Imaging System (IRIS) based at Aeromet, Inc. in Tulsa, OK; the Remote Area Safety Aircraft (RASA) based at Point Mugu, CA; the SeaLite Beam Director (SLBD) at White Sands Missile Range, NM; KMR improvements and modernization; and the Kwajalein Mobile Range Safety System (KMRSS).

MANAGEMENT AND OPERATIONAL SUPPORT provides personnel and related support costs common to all NMD projects including support to the Office of the Director, Ballistic Missile Defense Organization (BMDO) and his staff located in Washington, DC, as well as BMDO's Executing Agents within the U.S. Army Space and Missile Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office and the Joint National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits and infrastructure costs such as rents, utilities and supplies. Additionally, this project maintains NMD Joint Program Office (JPO) operations. NMD JPO scientific, engineering and technical assistance activities are funded to provide required contractor support to the JPO. Additionally, government salaries for NMD JPO personnel as well as Army NMD personnel in Huntsville are funded. Other Internal Operating Budget (IOB) costs such as travel, office expenditures, etc., are also provided through this project. The NMD JPO incorporates normal service headquarter type functions that are normally located in other appropriations (i.e., O & M accounts), but the NMD JPO has to pay personnel and support costs out of RDT&E program elements.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy.

FY 1997 ($ in Thousands):

- $24,100 NMD Integration: Issued a Request for Proposal for lead system integrator concept definition contracts. Awarded two contracts and initiated parallel concept definition studies. Prepared and released Request for Proposal to downselect from the two concept definition contractors to a single Lead System Integrator.

- $53,565 Sensor Technology: Initiated advanced optical coating development. Initiated follow-on program for LWIR HgCdTe FPAs and deliver 2 lots of hybrid arrays for testing. Delivered 35/60K PSC for characterization testing. Initiated / continued endurance testing on 150K PSC, 60K PSC, 35/60K PSC, 35K turbo cryocooler and 35/60K pulse tube cryocoolers. Completed prototype rad-hard 4Mbit SRAM. Completed prototype high speed, 14-bit analog-digital converter. Completed prototype rad-hard, fault-tolerant 32 bit processor. Continued non-cryogenic FPA signal processor. Initiated rad-hard visible star tracker effort. Delivered additional 60K PSC cooler. Completed thermal bus effort. Continued the collection and analysis of background and target data from the MSX satellite.

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- $272,003 GBI: Successfully conducted an EKV sensor flight test (IFT-1A), completed data analysis, and incorporated lessons learned into preparations for the FY98 and FY99 intercept flight tests. Completed fabrication, assembly, and CONUS testing of EKV sensor hardware for the FY98 sensor test and started assembly of hardware for FY98 intercept flight test. Continued EKV/PLV booster hardware and software integration, flight qualification, and acceptance testing. Acquired EKV hardware for FY99/00 EKV flight tests. Updated and validated EKV sensor, kill vehicle models and simulations based on seeker flight data. Continued SHIELD program to develop 256X256 silicon FPAs. Completed phase I transceiver package technology program and transferred effort to EKV prime contractors. Initiated development/fabrication/testing of EKV transceivers and IFICS modem suitable for use in the FY99 NMD integrated system test. Continued PET program to develop hardened HgCdTe FPAs.

- $50,651 BM/C3: Conducted BM/C3 engineering and integration activities to support BM/C3 prototype development, BM/C3 communications component prototype development and NMD system integration activities. Completed development of the second increment of the BM/C3 prototype, integrated with current increments of other BM/C3 components and with applicable external systems. Started development of BM/C3 prototype third increment. Supported NMD tests by providing integrated BM/C3 products as test articles. Supported IFT-1, IFT-1A, and ISTC Integration Tests-3 and -4.

- $66,129 GBR: Conducted CDR and baselined the NMD-GBR-P design. Began assembly and testing of antenna subarrays. Continued facility construction with a Joint Occupancy Date in 3QFY97. Began integration and installation of the GBR-P at USAKA. Began modifications to the TMD-GBR Dem/Val radar for NMD uses. Delivered RDS and HWIL to support software validation and Integrated Ground Tests (IGTs). Delivered Software Block 1/2. Potential use of Forward Based X-Band Radar was assessed.

- $12,122 UEWR: Initiated UEWR upgrade development. Recommended EWR upgrade solution by evaluating the feasibility, effectiveness and cost of hardware and software options for modifying EWRs to support NMD. Targets of opportunity were supported in coordination with NMD test and evaluation, system engineering and BMC3 efforts. Potential ISTC use of existing EWR HWIL assets were assessed.

- $47,122 System Engineering: Evaluated and refined user requirements into system requirements documents (C1,C2) based upon Capstone Requirements Document (CRD), Operational Requirements Document (ORD), and Concept of Operations (CONOPS). Planned and directed C2 Sims. Refined interface and configuration control requirements. Initiated CAIV and developed the NMD CARD's, including the NMD system card. Assessed and updated NMD threats and developed "design to" scenarios. Analyzed and updated contingency deployment options and continued to provide system analysis in support of objective contingency deployment. Initiated C3 requirements development. Initiated development of the High Fidelity System Simulation (HFSS). Analyzed and validated results of NMD flight tests.

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- $12,229 Deployment Planning: Completed the initial NMD Integrated Deployment Plan and initial Site Activation Plan. Continued preliminary site activation planning. Assessed the operational suitability requirements and the compliance of the NMD system and elements. Developed NMD Master Integrated Program Schedule for the development and deployment of the NMD system. Developed environmental compliance plan for the NMD system. Conducted deployment and logistics assessments in support of the NMD PDR.

- $102,867 Test and Evaluation: Supported ISTC Integration Tests 1 and 2, and integration of the following functions into the ISTC: BM/C3 Capability Increment 1 and 2; EKV real-time simulation for both contractors; GBR-P testbed; UEWR and X-band radars. Completed and maintained currency of TEMP, CARD and Test Strategy with the support of the NMD System T&E PIPT. Implemented V&V plan for ISTC. Completed program documentation, pre-launch preparations and oversee execution of IFT-1 and IFT-1A. Evaluated post-test results. Coordinated test range infrastructure and upgrades to support EKV flight tests from KMR. Coordinated range instrumentation upgrades and provided data collection and analysis for NMD testing. Conducted target launch for two EKV sensor flight tests (IFT-1 and IFT-1A).

- $17,400 Other NMD Initiatives: Explored the USAF NMD concept, including test facilities which provide a realistic and representative test scenario. FY97 activities included performing sensor track/data fusion, transmitting in-flight target updates and target object maps, acquiring targets, and demonstrating the launch control system.

- $19,587 Phenomenology: Provided AST core support for IFT-1, IFT-1a, MDT-3, and MDT-4 missions to collect optical data. Received, archived and distributed test data. Performed optical and radar data analysis of IFT-1, IFT-1a, Red Tigress III, MDT-3, and MDT-4 for NMD GBR, GBI, system design and test. Developed and evaluated GBR Build 4 higher order discrimination algorithms. Updated modeling of radar and IR target signatures.

- $1,989 Systems Architecture and Engineering: Continued systems analysis work on NMD issues. Provided system-level capability to address emerging BM/C3 architectures and requirements in a synergistic manner across all NMD/TMD efforts. Facilitated the translation of operational requirements to interoperable, affordable, evolvable, and supportable systems.

- $6,935 Threat and Countermeasures: Provided NMD System Threat Assessment (STA) and operational threat environment intelligence estimates, continued development of threat system scenario descriptions, and upgraded threat modeling capability and digital media threat products. Performed counter measures concept design and flight tests, continued work on dedicated countermeasures flight experiment.

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- $34,803 Modeling and Simulation: Provided infrastructure and core capability funding to the JNTF for hardware, software, systems engineering, supercomputing and wargaming resources. Provided maintenance of the BMD SSC. Supported BMDO and Service M&S activities in the five primary areas: standardization, assessments, development/modification, computer architecture/networks, and program management for system-level M&S programs. Provided supercomputing resources and infrastructure funding at the ARC/SC. Began design and development of the Wargame 2000 simulation tool for use in support of CinC wargames and exercises. Began development of the M&S Roadmap. Provided target discrimination and detection data support to the BMDO Data Center Programs, began development of the BMD Virtual Data Center, and provided acquisition and support services for the design, development, modernization and control of BMDO Mission Oriented ITR.

- $11,679 Test Resources: Provided ground test facility infrastructure and upgrades including: HWIL testing at KHILS; wind tunnel testing at Tunnel 9; shock-tunnel testing at AOEC; hover test and NMD safety net integration and flight support capability at NHTF; command/control technology experiments at CERES; lethality tests at AEDC Range C; sensor testing at POST, CALM, NRaD, and 7V/10V; phenomenology characterization and target signatures at AMOR and KHILS; and primary IR and black body calibration standards at the NIST. Provided test range infrastructure and upgrades to support EKV testing. Provided range instrumentation, upgrades, data collection and analysis for BMDO testing. Provided data collection and processing.

- $60,235 Management and Operational Support: Continued providing management and support for BMDO and NMD JPO overhead/indirect fixed costs, and continued to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.

- $18,000 Special Interest Programs: House Resolution 104-863
- $811,416 Total

FY 1998 ($ in Thousands):

- $143,016 NMD Integration: Complete parallel system integrator concept definition studies. Downselect to one LSI contractor. Initiate LSI base contract.

- $18,542 Sensor Technology: Deliver initial samples of advanced optical coatings for testing. Initiate/continue endurance testing of the 35/60K, 60K, and 150K coolers. Initiate 100K cooler for fore-optics. Extend cutoff wavelength of LWIR HgCdTe FPAs from current technology. Initiate optics development in contamination control technology. Continue development, fabrication, and test of advanced, radiation-hardened electronic components and packaging technologies for processors, memory, and analog-digital converters. Continue rad-hard visible star tracker development.

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- $300,155 GBI: Conduct one EKV seeker flight experiment (IFT-2), and one EKV intercept test (IFT-3). Reduce flight test data and incorporate results into HWIL simulations to prepare for IFTs 4 and 5. Upgrade mission and launch control hardware/software to replace old and unreliable equipment/software. Initiate acquisition of tactical booster to support flights starting in FY01. Complete fabrication of EKV and PLV hardware to support FY99 flight testing. Begin to fabricate EKV and PLV components for FY00 flight testing. Continue PET program to develop producible and hardened HgCdTe FPA's. Continue SHIELD program for the development of 256x256 Silicon FPA's.

- $62,227 BM/C3: Conduct BM/C3 engineering and integration activities to support BM/C3 Prototype development, BM/C3 communications component prototype development and NMD system integration activities. Complete development of the third increment of the BM/C3 Prototype, integrate with current increments of other BM/C3 components and with applicable external systems. Start development of the BM/C3 prototype fourth and fifth increment. Support NMD tests by providing integrated BM/C3 products as test articles. Support IFT-2, IFT-3, IGT-1A, and IGT-2. Deliver brassboard IFICS and prototype IFICS.

- $56,235 GBR: Complete facility construction with a Beneficial Occupancy Date in 1QFY98. Complete integration and installation of the GBR-P at USAKA. Planning for USAKA Readiness Review. Deliver Software Block 3. Conduct on-line system verification test in 3QFY98. Potential use of Forward Based X-Band Radar will be assessed. Shadow targets of opportunity for radar calibration.

- $15,545 UEWR: Continue the conduct of real-time missile tracking experiments using EWR and other applicable existing sensors. Provide UEWR Demonstrator for participation in NMD integrated system tests. Continue system development and program risk definition and risk reduction. Manage UEWR portion of the LSI contract.

- $43,358 System Engineering: Conduct NMD System Interim Preliminary Design Review (IPDR). Assess and refine user requirements based upon updated CRD, ORD, and CONOPs. Plan and direct C2 Sims. Develop System Evaluation Plan (SEP), and deliver low fidelity version of the High Fidelity System Simulation (HFSS). Conduct NMD System PDR. Finalize interface and configuration control requirements in support of development options. Initiate Configuration Control Board (CCB) and Risk Management Board (RMB). Develop C3 requirements. Develop an NMD Systems Engineering IV & V Master Plan. Assess NMD threat and develop C3 scenarios. Update CARD's to reflect C1/C2 requirement to support the ICE. Support the LSI System Functional Review (SFR). Analyze and validate results of NMD flight and ground tests.

- $18,041 Deployment Planning: Update the NMD Integrated Deployment Plan and the NMD Site Activation Plan to reflect programmatic changes and refinements in the NMD architecture. Support development of the NMD System Training Plan and System Safety Plan. Efforts will continue in the areas of program and deployment schedule integration, critical path analysis and identification of deployment risk mitigation actions. Continue environmental analyses of candidate deployment sites and required documentation.

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–	$141,776	Test and Evaluation: Support ISTC Integration Test 3 and IGT-2A, and integration of the following into the ISTC: BM/C3 Capability Increment 3; GBI HWIL upgrade, and real-time simulations. Maintain currency of TEMP, CARD and Test Strategy with the support of the NMD System T&E PIPT. Complete program documentation, pre-launch preparations and oversee execution of IFT-2 and IFT-3. Evaluate post-test results. Complete VV&A of IFT-3 target and implement accreditation plan for ISTC. Complete lethality and live fire testing plan. Coordinate test range infrastructure and upgrades to support EKV flight tests from KMR. Coordinate range instrumentation upgrades and provide data collection and analysis for NMD testing. Conduct target launch for IFT-2 and IFT-3. Implement rolling spare target for IFT-2 and beyond.
–	$10,639	Discrimination: Provide AST core operating costs for IFT-2, IFT-3, and Op Evals to collect optical data to support NMD. Continue optical and radar data analysis for NMD system design and test. Provide discrimination algorithms to GBR, SBIRS, and GBI programs to counter advanced threats and penaids. Update modeling capabilities in the NMD scenario.
–	$3,895	Systems Architecture and Engineering: Continue systems analysis work on NMD issues. Provide system-level capability to address emerging BM/C3 architectures and requirements in a synergistic manner across all NMD/TMD efforts and facilitate the translation of operational requirements to interoperable, affordable, evolvable, and supportable systems.
–	$3,700	Threat and Countermeasures: Provide NMD STA and operational threat environment intelligence estimates, continue development of threat system scenario descriptions, and upgrade threat modeling capability and digital media threat products.
–	$8,060	Modeling and Simulations: Complete Wargame 2000 simulation NMD IOC WARGAME DEMO and Critical Design Review (CDR), provide supercomputing resources and infrastructure funding at the ARC/SC, continue development of the M&S Roadmap and continue to fund modernization and upgrades of Mission Oriented ITR. The BMD SSC will continue to develop processes for testing and improving models, data and algorithms and will update the NMD M&S and data catalogs/repositories. The BMDO Data Centers will continue to archive, manage, develop data products, distribute and provide remote access to all relevant BMD test, experiment, M&S and wargame data.
–	$13,920	Joint National Test Facility: Provides core funding for the JNTF for the BMDO's joint missile defense modeling, simulation, and test center whose focus is the joint inter-service, interoperability, and integration aspects of missile defense system acquisition. The JNTF conducts human-in-the-loop missile defense wargaming for concept of operations (CONOPS) exploration and development; provides simulation, communication connectivity and other JNTF assets in support of BMDO- and CINC-sponsored theater missile defense exercises; hosts increments of the NMD BMC3 capability. The JNTF also performs studies and analysis in support of joint missile defense and provides inter-service computational capabilities and wide area network communication networks with Service facilities.

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- $10,496 Test Resources: Provide ground test facility infrastructure and upgrades for BMDO testing including: IR sensor HWIL testing at KHILS, wind tunnel testing at Tunnel 9, hover test capability at NHTF, command/control technology experiments at CERES, lethality tests at AEDC Range G, sensor testing at POST, CALM NRaD, and 7V/10V phenomenology characterization and target signatures at KHILS, and primary IR and blackbody calibration standards at the NIST. Provide test range infrastructure and upgrades to support EKV testing. Provide range instrumentation, upgrades, data collection, and analysis for BMDO testing.

- $91,537 Management and Operational Support: Continue providing management and support for BMDO and NMD JPO overhead/indirect fixed costs, and continue to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management. These include personnel costs both at the NMD JPO in Washington, DC for 49 civilians and Huntsville, AL for 168 civilians.

- $941,142 Total

FY 1999 ($ in Thousands):

- $343,279 NMD Integration: Conduct FY99 NMD integrated system test (IFT-5) and support the NMD Deployment Readiness Review.

- $19,619 Sensor Technology: Deliver final samples of advanced optical coatings for testing. Deliver 2 lots of LWIR HgCdTe FPAs with extended wavelength cutoff. Initiate silicon FPA development to very long wavelength regime. Initiate continuous 10K sorption cooler effort. Continue endurance testing on 150K, 60K, and 35/60K PSC cryocoolers. Deliver prototype contamination control device. Initiate silicon carbide telescope effort. Continue development, fabrication, and test of advanced, radiation-hardened electronic components and packaging technologies for processors, memory and analog-digital converters. Deliver prototype non-cryogenic FPA signal processor. Continue rad-hard visible star tracker effort. Deliver rad-hard electrically erasable programmable read-only memory (EEPROM). Provide predicted and exploited signature data for test planning and systems effectiveness tasks.

- $227,999 GBI: Perform IFT-4 and participate in the NMD integrated system test (IFT-5) using EKV and PLV. Fabricate EKV for fourth intercept flight (IFT-6), incorporating technology improvements and lessons learned from IFTs 1-4. Downselect to single EKV development contractor. Continue dedicated booster development and prepare for two propulsion verification tests in FY00. Deliver flight ready SHIELD and PET FPAs and readout electronics.

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- $50,047 BM/C3: Conduct BM/C3 engineering and integration activities to support BM/C3 Prototype development, BM/C3 communications component prototype development and NMD system integration activities. Complete development of the fourth and fifth increment of the BM/C3 Prototype, integrated with current increments of other BM/C3 components and with applicable external systems. Support NMD tests by providing integrated BM/C3 products as test articles. Support IGT-3 through IGT-6, and support IFT-4 through IFT-6. Integrate prototype IFICS at Kwajalein Missile Range (KMR).

- $48,653 GBR: Participate in IFT-4 on-line and the NMD integrated system test (IFT-5) with GBR-P in-line. Continue algorithm development. Develop P3I program. Hardware and software validation.

- $29,809 System Engineering: Assess and refine user requirements based upon updated CRD, ORD, CONOPs. Plan and direct C2 Sims. Deliver high fidelity version of the High Fidelity System Simulation (HFSS). Conduct NMD System CDR. Finalize interface and configuration control requirements in support of deployment options. Continue C1/C2/C3 requirements refinement. Continue the NMD Systems Engineering IV&V Master Plan. Assess and update the NMD threat and update scenarios. Analyze and validate results of NMD flight and ground tests. Begin preparations for the NMD Deployment Readiness Review in FY00.

- $17,724 Deployment Planning: Refine the NMD Integrated Deployment Plan and the NMD Site Activation Plan to reflect programmatic changes and refinements to the NMD architecture. Prepare deployment assessment for the NMD Deployment Readiness Review. Assessment will include all aspects of deployment (industrial base assessment, operational suitability assessment, deployment risk analysis and site activation summary). Complete tactical site design to support deployment review and meet deployment timelines. Update program and deployment schedule information and refine critical path analysis of the NMD system.

- $140,984 Test and Evaluation: Support IGT-3 and IGT-4. Maintain currency of TEMP, CARD and Test Strategy with support of the NMD System T&E PIPT. Complete program documentation, pre-launch preparations and oversee execution of IFT-4 and IFT-5. Evaluate post-test results. Complete VV&A of IFT-4 and IFT-5 targets and fully accredit the ISTC. Implement lethality and live fire testing plan. Coordinate test range infrastructure and upgrades to support EKV flight tests from KMR. Coordinate test range instrumentation upgrades and provide data collection and analysis for NMD testing. Conduct target launches for IFT-4 and IFT-5.

- $0 Discrimination: This project funding is moved to PE 0603874C starting in FY99.

- $0 Systems Architecture and Engineering: This project funding is moved to PE 0603874C starting in FY99.

- $0 Threat and Countermeasures: This project funding is moved to PE 0603874C starting in FY99.

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- $0 Modeling and Simulations: This project funding is moved to PE 0603874C starting in FY99.
- $0 Joint National Test Facility: This project funding is moved to PE 0603874C starting in FY99.
- $490 Test Resources: Provide ground test facility infrastructure and upgrades for BMDO sensor testing at MOSTT/POST and 7V/10V.
- $71,869 Management and Operational Support: Continue providing management and support for overhead/indirect fixed costs, and continue to provide management and analysis support to the NMD program in areas such as cost/schedule/performance assessment, cost estimating and analysis, budget analysis and formulation, program planning and control, contract management.
- $950,473 Total

Acquisition Strategy: A central feature of the NMD Program strategy is the awarding of a contract for an NMD Lead Systems Integrator (LSI). The objective of this approach is to have a single contractor, executing under government direction, who will be charged with the contractor accountability to design, develop, test, integrate, and potentially deploy an NMD system. The LSI will integrate all existing NMD element development activities and initiate development of other elements as necessary. Currently, two LSI Concept Definition Phase contracts have been awarded. This phase is providing a basis upon which each contractor team develops their individual integration concepts. In FY98, the government will downselect a single contractor who will perform in the LSI execution phase. A key aspect of this phase will be the successful completion of an NMD integrated system test in FY99 which is intended to demonstrate an initial NMD capability.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	828,864	504,091	393,085	1,726,040
Appropriated Value		978,091		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-36,949		
b. Internal Realignments		0		
FY1999 President's Budget	811,416	941,142	950,473	2,703,031

Change Summary Explanation:

Funding: FY98: Additional resources ($474M) were allocated, and adjustments, including OSD reductions, were made.
FY99: Increase per Mission Realignment based on the QDR.

Schedule: N/A

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Technical: N/A

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
PE 0603871C NMD MILCON Design	0	540	12,230	0	0	0	0		12,770

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Engineering Milestones												
a. GBR-P PDR												
b. NMD SRR												
c. GBR-P CDR	*											
d. NMD IPDR					*							
e. NMD PDR								X				
f. NMD CDR												X
Test and Evaluation Milestones												
g. BM/C3 Legacy+												
h. BM/C3 Capability Increment 1												
i. C2 Sim 96B												
j. IFT-1		*										
k. C2 Sim 97A			*									
l. IFT-1A			*									
m. BM/C3 Capability Increment 2			*									
n. C2 Sim 97B					X							
o. IFT-2						X						
p. BM/C3 Capability Increment 3						X						
q. C2 Exercise 98A							X					
r. IGT-1A							X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
NMD Integration	24,100	143,016	343,279
Sensor Technology	53,565	18,542	19,619
Ground Based Interceptor	272,003	300,155	227,999
Battle Management, Command , Control and Communications	50,651	62,227	50,047
Ground Based Radar	66,129	56,235	48,653
Upgraded Early Warning Radars	12,122	15,545	0
Systems Engineering	47,122	43,358	29,809
Deployment Planning	12,229	18,041	17,724
Test and Evaluation	102,867	141,776	140,984
Other NMD Initiatives	17,400	0	0
Discrimination	19,587	10,639	0
Systems Architecture and Engineering	1,989	3,895	0
Threat and Countermeasures	6,935	3,700	0
Modeling and Simulation	34,803	8,060	0
Join National Test Facility	0	13,920	0
Test Resources	11,679	10,496	490
Management and Operational Support	60,235	91,537	71,869
Special Interest Programs	18,000	0	0
Total	811,416	941,142	950,473

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
NMD INTEGRATION										
Boeing	FP	3Q/97				10,000	0	0		10,000
UMDC	FP	3Q/97				10,000	0	0		10,000
TBD	CPAF	3Q/98				0	143,016	343,279	continues	486,295
Misc						4,100	0	0		4,100
GBI										
Hughes	CPFF	9/90				82,316	101,950	51,900	continues	312,082
Boeing	CPFF	9/90				93,687	103,455	44,500	continues	316,698
Lockheed	CPIF	1/86				65,960	68,192	56,000	continues	249,944
Winner EKV						0	0	49,600	continues	49,600
NRC	CPAF	3/92				3,380	0	0		9,867
NRC (New SETA)	TM	4/97				2,403	3,866	4,137	continues	10,406
Sparta	CPFF	8/92				2,148	1,704	2,000	continues	7,642
ASGI	CPFF	6/89				0	0	0		1,307
Mevatec	CPFF	11/93				0	0	0		1,045
Mevatec (New SETA)	TM	4/97				212	371	400	continues	983
SY Technology	TCPFF	10/96				1,525	2,850	3,050	continues	7,425
Hughes (PET)	CPFF	9/90	26,625	26,625		1,499	1,439	1,448	continues	6,686
Liris (PET)	CPFF	9/90	25,425	25,425		1,498	1,438	1,448	continues	6,684
BNA (SHLD)	CPFF	11/92	6,580	6,580		2,308	0	0		4,228
TRW	CPFF	9/95	1,787	1,787		0	0	0		1,457

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Harris	CPFF	9/95	1,315	1,315		499	0	0		1,601
SFAE-MD	N/A	N/A				0	0	0		13,478
TBE	CPAF	3/92				527	0	0		527
TBE (New SETA)	TM	4/97				5,512	7,690	8,228	continues	21,430
Stone Engineer	CPFF	9/96				300	430	460	continues	1,190
CST	CPFF	11/96				86	86	95	continues	267
Dynetics	CPFF	2/93				80	0	0		80
Rockwell	CPFF	4/94				480	0	0		480
Kaman	CPFF	6/90				095	0	0		95
OGA's						3,418	6,026	4,243	continues	13,687
Misc	TBD	TBD				4,070	658	490	continues	19,194
BM/C3										
TRW	CPFF	8//23/91	97,347	97,347		19,208	33,000	0		94,947
BDM	CPAF/CPFF	12/27/94	16,461	16,461		3,900	0	0		10,150
LSI (BMC3 Dev & Integration)	TBD	TBD				0	5,429	36,203	continues	41,632
National Labs	MIPR	Annual				1,800	0	1,800		4,000
Nichols Research	CPFF	11/30/89				1,153	0	0		2,013
NSWC	N/A	N/A				730	3,600	540	continues	5,170
MITRE	FFRDC	Annual		10,074		2,358	2,660	1,624	continues	8,673
SENCOM	CPFF	9/30/90		6,139		1,600	1,725	1,068	continues	5,738
PEO-AMD	N/A	N/A				2,688	0	0		4,828
COE	MIPR	Annual		5,000		785	0	0		1,060
SPARTA	CPFF	8/24/88				636	663	214	continues	2,931
TBE	CPAF	4/23/93				940	1,300	735	continues	3,992
Nichols	CPAF	4/23/93				1,144	1,581	788	continues	4,444
TRW	CPAF	1/31/91	7,601	7,601		2,091	1,800	1,100	continues	7,001

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Loral	CPAF	1/31/91	6,942	6,942		1,875	1,648	700	continues	6,442
VRI	CPAF	1/14/92	3,239	3,239		893	880	600	continues	2,839
Misc			1,180	1,180		8,850	7,941	4,675		29,225
GBR										
Raytheon	CPAF	11/94	148,922	148,922		58,598	18,715	14,800	continues	154,135
TBE	CPAF	3/92				1,000	4,465	2,300	continues	10,241
Colsa	CPFF	6/89				0	9,785	7,300	continues	20,515
GRA	CPFF	7/96				0	1,710	0		2,810
SFAE-MD	N/A	N/A				4,700	0	0		20,437
MIT (Lincoln Labs)	FFRDC	Annual				0	9,500	9,000	continues	18,500
Hughes	CPAF	4/96				0	5,605	8,300	continues	13,905
Misc	N/A	N/A				1,831	6,455	6,953	continues	17,474
UEWR										
Xontech	T&M	1/3/95	8,370	8,370		6,126	0	0		7,000
SENCOM	T&M	10/1/94	5,669	5,699		870	1,950	0		3,569
Alphatech	CPAF		2,314	2,314		0	0	0		2,314
Mitre	FFRDC	Annual	11,166	11,166		2,408	2,890	0		7,731
X-band Radar	Various		TBD	TBD		1,000	2,850	0		5,150
LSI	Various		TBD	TBD		0	2,000	0		2,000
Misc	N/A	N/A				1,718	5,855	0		8,393
SENSOR TECH										
Hughes	CPFF	1/90	12,892	8,692		1,583	0	0		3,473
Analog Devices	CPFF	9/91	8,993	8,993		1,488	1,000	1,671	continues	5,459

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
TBD	CPIF	3/98	TBD	5,000		0	744	1,015	continues	1,759
TBD	CPIF	3/98	TBD	19,600		0	3,820	3,770	continues	7,590
TBD	CPFF	3/98	TBD	1,800		0	693	507	continues	1,200
Hughes	CPFF	9/97	12,582	12,582		600	1,850	1,300	continues	3,750
MRC	CPFF	1/91	5,654	5,654		922	158	0		3,392
Phillips Lab	N/A	N/A				260	1,500	1,000	continues	3,900
AFRL	CPAF	9/95				1,044	1,821	1,676	continues	5,811
Ball Aero	CPAF	8/94				611	50	50	continues	741
Lockheed Martin	CPAF	1/96				193	0	0		600
Creare	CPAF	10/95				1,148	918	154	continues	2,483
Hughes	CPFF	11/92				80	54	54	continues	296
Swales	CPFF	2/96				398	0	0		750
Aerospace	CP	9/95				500	570	570	continues	2,050
Cubic / MMS	CP	10/98				0	0	600	continues	600
Ball	CPAF	3/95				1,505	1,500	1,500	continues	4,845
AFRL	N/A	N/A	600	600		105	126	150	continues	381
Logicon	CPAF	4/97	125	125		125	0	0		125
S Systems Corp	CPAF	4/97	270	270		270	0	0		270
Hughes	CPFF	TBD	5,487	5,487		0	874	850		1,724
Crane	CPAF	3/30/90	1,490	1,490		0	0	0		1,290
Lockheed Martin	CPAF	1/10/96	1,830	1,830		1,000	175	0		1,582
TRW	CPAF	1/90				925	800	800	continues	4,735
Honeywell	CPAF	1/90				925	800	800	continues	3,645
Hughes	CPAF	2/93	6,620	6,620		0	0	0		1,470
Rockwell	CPAF	2/93	6,670	6,670		0	0	0		2,030
Xontech						0	0	0		1,400
WPAFB	N/A	N/A				0	0	0		1,600
JHU/APL	CPFF	10/1/91	165,841	165,841		0	0	0		11,644
JHU/APL(B)	CPFF	4/1/95	39,894	39,894		9,938	0	0		16,938
MDA	CPFF	1/2/92	53,169	53,169		0	0	0		1,350

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603871C National Missile Defense					PROJECT 2400
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
USU(SP)	CPFF	6/15/88	90,586	90,586		1,635	0	0		8,487
USU(DPC)	CPFF	8/7/92	20,800	20,800		3,596	0	0		7,999
NRC	CPFF	12/1/93				1,627	0	0		6,884
Misc NASA	MIPR	N/A				598	0	0		831
USASSDC	N/A	N/A				580	0	0		4,821
AFSMC	N/A	N/A				8,509	0	0		19,340
NRL	N/A	N/A				2,300	0	0		4,609
USASSDC	N/A	N/A				1,161	559	1,223	continues	4,499
JHU/APL	CPAF	6/96	17,000	17,000		950	0	0		6,180
Misc Contracts						8,989	530	1,929	continues	16,999
OTHER NMD INITIATIVES										
TRW	CPIF	2/97				350	0	0		350
NRC						721	0	0		721
SAIC						1,107	0	0		1,107
Aerospace						500	0	0		500
APL						384	0	0		384
OO-ALC-REA						4,200	0	0		4,200
OO-ALC-M&S						775	0	0		775
ESC/XRS						1,960	0	0		1,960
BESC						400	0	0		400
NRC (SHIELD)						2,250	0	0		2,250
AST						600	0	0		600
SNL/IFTU/TSPN						900	0	0		900
Phillips Lab						882	0	0		882
AFSPC						1,910	0	0		1,910
SMC/TEB						60	0	0		60
SMC/ADE						358	0	0		358

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603871C National Missile Defense PROJECT 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Misc contracts						43	0	0		43
SPECIAL INTEREST PROGRAMS										
TBD	TBD	TBD				18,000	0	0		18,000
Support and Management Organizations										
SYSTEM ENGINEERING										
TRW	CPFF	8/95				31,309	27,345	14,215	continues	111,702
BDM	CPAF/CPFF	12/27/94				5,044	0	0		12,899
USSPACECOM	N/A	N/A				1,549	1,550	1,500	continues	5,799
JNTF	N/A	N/A				3,897	4,855	5,700	continues	17,552
DSWA	MIPR	N/A				1,748	1,467	1,500	continues	6,465
ARSPACE	N/A	N/A				579	1,140	500	continues	3,019
AFSPACE	N/A	N/A				499	600	500	continues	2,099
USAF/SMC/SE	N/A	N/A				1,998	475	500	continues	4,473
USAF/SMC/ SBIRS	N/A	N/A				0	1,000	1,000	continues	2,000
NAVSPACE	N/A	N/A				499	48	48	continues	1,095
NSWC	N/A	N/A				0	1,017	1,000	continues	2,017
Threat and CM	N/A	N/A				0	3,515	3,000	continues	6,515
POET	MIPR	N/A				0	48	48	continues	96
EADTB	MIPR	N/A				0	250	250	continues	500
SMDC	N/A	N/A				0	48	48		96

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE: February 1998
BUDGET ACTIVITY: 4 - Demonstration and Validation					PE NUMBER AND TITLE: 0603871C National Missile Defense					PROJECT: 2400
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
DEPLOYMENT PLANNING										
TRW	CPFF	8/23/95				7,710	5,245	4,139	continues	19,552
NIST	MIPR	N/A				450	997	871	continues	2,810
SFAE-MD	N/A	N/A				1,443	0	0		4,573
USAF/SMC	N/A	N/A				230	485	518	continues	1,733
USSPACECOM	N/A	N/A				1,498	1,221	540	continues	4,230
TBD	CPFF	FY97				0	2,610	1,670	continues	4,280
USA Corp of Eng	N/A	N/A				0	1,100	1,135		2,235
TBD	CPFF	FY97				0	1,000	0		1,000
Misc contracts	N/A	N/A				898	2,504	163	continues	7,489
Misc	TBD	TBD				0	2,879	8,688		11,567
MANAGEMENT AND OPERATIONAL SUPPORT										
BDM	CPAF/CPFF	12/27/94				16,981	24,600	22,477	continues	84,660
SFAE-MD	N/A	N/A				8,884	23,395	19,618		51,897
USASSDC	N/A	N/A				2,564	3,180	3,238		8,982
Misc (SBIR)	N/A	N/A				0	9,416	0		9,416
Operational accounts	N/A	N/A				31,806	30,946	26,536	continues	89,288
DISCRIMINATION										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Boeing	CPFF	9/95				3,238	3,406	0	continues new PE	9,693
MIT/LL	FFRDC	10/95				5,410	1,902	0	continues new PE	12,755
Xontech	CPFF	10/96				1,667	0	0	continues new PE	3,333
USASSDC	N/A	N/A				658	588	0	continues new PE	1,758
Misc contracts	N/A	N/A				8,614	4,743	0		21,428
SYSTEMS ARCH AND ENGINEERING										
SPARTA						900	1,138	0	continues new PE	3,969
BDM	CPAF/CPFF	12/27/94				600	882	0	continues new PE	2,552
Misc contracts						489	1,875	0	continues new PE	2,414
THREAT & CM										
Sandia	N/A	N/A				1,200	0	0		2,500
MIT/LL	FFRDC	N/A				1,300	0	0		3,800
OGAs	N/A	N/A				1,046	390	0	continues new PE	2,385
Misc contracts	N/A	N/A				3,389	3,310	0	continues new PE	9,895

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Test and Evaluation Organizations										
TEST & EVALUATION										
TBE	CPAF	4/92				15,043	7,000	7,000	continues	36,090
Colsa	CPFF	6/89				5,765	4,000	1,000	continues	11,965
Rockwell	CPFF	5/96				2,500	2,700	0		7,400
Hughes	CPFF	5/96				3,900	0	0		5,900
TRW	CPAF	2/95				246	0	0		246
TRW	CPFF	8/95				2,500	2,490	0		4,990
Raytheon	CPFF	9/92				1,400	1,500	0		2,900
SAIC	CPAF	1/97				916	450	250	continues	1,616
Nichols	CPAF	1/97				1,767	1,680	250	continues	3,697
SRS	CPFF	6/94				1,382	900	0		2,282
USAKA	N/A	12/96				5,056	10,810	0		15,866
SPAWAR	N/A	11/96				900	0	0		900
Sandia	N/A	3/97				1,620	100	0		1,720
USASSDC	N/A	N/A				1,555	900	0		2,910
JNTF	N/A	N/A				600	510	0		1,110
NRL	N/A	N/A				100	100	120	continues	320
Misc contracts	TBD	TBD				16,377	32,909	4,825	continues	70,214
GBI Targets:										
USASSDC	N/A	N/A				200	0	1,905	continues	2,444
Sandia	N/A	10/95				10,403	0	60,000	continues	80,465
SMC	N/A	10/95				1,398	1,000	44,000	continues	53,550
Lockheed	N/A	10/95				17,953	4,000	9,115	continues	38,056
Sy Technology	CPFF	9/96				591	200	625	continues	1,416
TBE	CPAF	3/92				455	16,405	620	continues	18,202

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
TRW	CPFF	10/95				1,300	0	1,300	continues	2,600
Boeing	CPFF	10/90				40	2,630	0		2,670
Hughes	CPFF	10/90				40	0	0		40
Vista	CPFF	12/95				170	0	171	continues	341
Colsa	CPFF	2/94				10	0	0		10
Stone Engineer	CPFF	10/96				0	0	150	continues	150
NAIC	N/A	N/A				0	1,200	0		1,200
Xontec	TBD	TBD				0	1,520	0		1,520
Mitre	TBD	TBD				0	360	0		360
Dynetics	TBD	TBD				0	450	0		450
Misc contracts	TBD	TBD				322	47,962	9,653	continues	57,937
MSX Targets:										
USASSDC	N/A	10/96				100	0	0		7,075
Sandia	N/A	10/95				4,887	0	0		11,664
TBE	CPAF	3/92				177	0	0		1,950
MICOM	N/A	10/96				680	0	0		1,272
Stone Engineer	CPFF	9/96				150	0	0		150
NASA-LBJ	N/A	10/95				200	0	0		200
Tooele Depot	N/A	10/95				73	0	0		73
Sierra Depot	N/A	10/95				100	0	0		100
PMR	N/A	10/95				100	0	0		100
Rock Island ARS	N/A	10/95				100	0	0		100
SMC (USAF)										
SY Technology										
Misc contracts	TBD	TBD				1,791	0	0		1,791
MODELLING AND SIMULATION										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
AMSC	N/A	10/90				0	473	0		473
BCOE	N/A	10/90				0	237	0		237
MDDC	N/A	10/89				0	887	0		887
Colsa (ARC)	SS/CPFF	10/95				3,589	606	0	continues new PE	6,275
MRC (SC)	Comp/CPFF	10/95				1,196	202	0	continues new PE	2,092
USASSDC	N/A					1,221	960	0		3,199
NRL	N/A					784	0	0		1,027
AFSPACE	N/A					265	0	0		413
TRW (JNTF)	C/CPAF	10/95				10,896	780	0	continues new PE	16,020
Lockheed Martin (JNTF)	C/CPAF	10/95				16,344	1,169	0	continues new PE	24,029
BMDO	N/A					508	2,746	0	continues new PE	4,252
JOINT NATIONAL TEST FACILITY										
TRW	C/CPAF	FY95				0	1,808	0	continues new PE	1,808
Lockheed Martin	C/CPAF	FY95				0	4,673	0	continues new PE	4,673
Vanguard	C/CPAF	FY95				0	1,055	0	continues new PE	1,055
Government	N/A	N/A				0	6,384	0	continues new PE	6,384

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603871C National Missile Defense

PROJECT: 2400

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
TEST RESOURCES										
USASSDC	N/A	N/A				1,875	2,908	0	continues	8,338
Phillips Lab	N/A	N/A				950	1,000	0	new PE continues	2,649
Wright Lab	N/A	N/A				931	1,000	0	new PE continues	3,090
Det2-SMC	N/A	N/A				300	300	0	new PE continues	900
NIST	N/A	N/A				100	100	0	new PE continues	300
Arnold Engin.	N/A	N/A				2,250	1,525	0	new PE continues	3,875
NSWC	N/A	N/A				727	725	0	new PE continues	2,187
SPAWAR	N/A	N/A				412	410	0	new PE continues	1,210
Misc contracts	N/A	N/A				4,134	2,528	490	new PE continues new PE	10,974

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603871C National Missile Defense					PROJECT 2400
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
N/A					0	0	0		
Support and Management Property									
N/A					0	0	0		
Test and Evaluation Property									
N/A					0	0	0		
Subtotal Product Development					513,970	595,720	689,597		2,312,669
Subtotal Support and Management					148,097	171,170	119,402		556,521
Subtotal Test and Evaluation					149,349	174,252	141,474		562,359
Total Project					811,416	941,142	950,473		3,431,549

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Joint Theater Missile Defense Activities (Dem / Val) PE 0603872C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	493,429	582,000	176,846	219,480	217,220	221,349	219,982	TBD	TBD
1155 Discrimination**	30,919	35,964	0	0	0	0	0	TBD	TBD
1161 Advanced Sensor Technology	3,299	0	0	0	0	0	0	TBD	TBD
1170 TMD Risk Reduction	22,949	25,987	19,116	20,386	21,899	21,788	21,750	Continuing	Continuing
1294 UAV Boost Phase Intercept	930	0	0	0	0	0	0	TBD	TBD
2160 TMD Existing System Mods	15,819	5,030	2,501	0	0	0	0	TBD	TBD
2259 Israeli Cooperative Project ***	42,393	50,573	0	0	0	0	0	TBD	TBD
3153 Systems Architecture and Engineering**	9,051	7,942	0	0	0	0	0	TBD	TBD
3157 Environmental, Siting, and Facilities	5,047	3,097	2,604	2,496	2,619	2,462	2,402	Continuing	Continuing
3160 TMD Readiness	1,692	0	0	0	0	0	0	TBD	TBD
3251 Systems Engineering and Technical Support*	45,536	62,861	19,974	24,871	20,813	23,020	22,396	Continuing	Continuing
3261 TMD BM/C3I (BM/C3I Concepts)*	30,584	35,465	0	0	0	0	0	TBD	TBD
3265 User Interface	15,762	16,280	18,046	20,462	21,519	21,375	21,366	Continuing	Continuing
3270 Threat and Countermeasures Program**	21,012	21,496	0	0	0	0	0	TBD	TBD
3352 Modeling and Simulations**	66,409	53,153	11,605	12,013	11,922	11,847	11,836	Continuing	Continuing
3353 JNTF - TF**	0	39,184	0	0	0	0	0	TBD	TBD

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3354 Targets Support	21,736	53,219	21,153	51,975	41,093	41,167	41,129	Continuing	Continuing
3359 System Test and Evaluation*	38,970	36,191	4,816	5,277	5,817	5,802	5,786	Continuing	Continuing
3360 Test Resources**	36,968	61,904	13,788	13,391	13,334	13,283	13,238	Continuing	Continuing
4000 Operational Support**	84,353	73,654	63,243	68,609	78,204	80,605	80,079	Continuing	Continuing

* Some or all of the funding in these projects for FY99-03 was transferred to PE 0603873C. See those R2s for FY99-03 funding.
** Some or all of the funding in these projects for FY99-03 was transferred to 0603874C. See those R2s for FY99-03 funding.
*** All of the funding in this project for FY99-03 was transferred to 0603875C. See those R2s for FY99-03.

ARCHITECTURE

A. **Mission Description and Budget Item Justification**

The Theater Missile Defense (TMD) program's goal is to develop, maintain and deploy a cost-effective, Anti-Ballistic Missile (ABM) Treaty compliant system designed to protect the United States and its Allies against the immediate and growing threat from shorter range theater ballistic missiles. The TMD core programs are PATRIOT Advanced Capability (PAC)-3, Theater High Altitude Area Defense (THAAD) System, and Navy Area Theater Ballistic Missile Defense (TBMD) formerly (Lower Tier) and Navy Theater-Wide TBMD formerly(Upper Tier).

Theater Missile Defense programs, projects, and activities in Advanced Development that have as a primary objective the development of technologies capable of supporting systems, components, and architectures that could produce highly effective defenses against theater missile threats. Includes manpower authorizations and the associated costs specifically identified and measured to the performance of these programs.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. Further justification of the Budget Activity code assigned to each Program Element is contained within the Brief Description of Element section of each Program Element Summary.

Acquisition Strategy: See Individual R2 summaries.

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B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	506,492	542,619	514,109	1,992,357
Appropriated Value		605,419		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-23,419		
b. Internal Realignments				
FY1999 President's Budget	493,429	582,000	176,846	1,682,798

Change Summary Explanation: See Individual R2 summaries.
Funding: The large decrease in this PE's FY99 funding is due to a PE realignment which took funding out of this PE and put it into 0603873C, 0603874, 0603875C and 0603876C.
Schedule: See Individual R2 summaries.
Technical: See Individual R2 summaries.

C. Other Program Funding Summary ($ in Thousands) See Individual R2 summaries.

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile See Individual R2 summaries.

FY 1997				FY 1998				FY 1999			
1	2	3	4	1	2	3	4	1	2	3	4

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COST ($ In Thousands)	FY-1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1155 Discrimination**	30,919	35,964	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

This project provides the U.S. with the data and predictive tools to generate high confidence target signatures for ballistic missile defenses (BMD). This is a critical adjunct to the evaluation of BMD system performance across the full spectrum of threats and engagement scenarios. This program provides data collection sensors and instruments for use on live-fire missions and analysis of the resulting test data. This program provides predictive models of target signatures in both Radar and Infrared spectrums. This program evaluates and develops algorithms for the critical functions of discrimination, target handover, and aimpoint selection. This program provides for data storage and retrieval of all ballistic missile defense office (BMDO) sponsored tests per statutory requirements.

Data Centers and Management. Storage, archival, and retrieval of signature related data is provided by the BMDO-funded Missile Defense Data Center (MDDC) and Advanced Missile Signature Center (AMSC). Both MDDC and AMSC meet the statutory requirements for program data archiving. Starting in FY 98, Data Centers and Management are transferred to Project 3352.

Data Collection Platforms. This project provides core operating costs for Airborne Surveillance Testbed (AST) target signature collection sensor and platform. Mission costs for AST are provided by user acquisition programs. This project provided FY 96 termination costs for the COBRA EYE sensor. This project monitors other BMDO signature data collection programs to ensure complete coverage and avoid duplication.

Algorithms and Analysis. This project performs analysis of radar and optical data on ballistic missile threat signatures and intercept events for the Theater High Altitude Area Defense (THAAD), Navy Theater Wide (NTW), and Navy Area Defense System (NADS) programs. This project develops and evaluates discrimination and kill assessment algorithms for the THAAD, NTW, and NADS programs. In analysis, this project provides accurate, objective, and timely flight data analysis in support of target signature phenomenology characterization and sensor algorithm development and evaluation. This includes TMD optical sensor data from the TMD targets program, project 1170, project 3270, and others. This project provides post-flight characterizations of expected and unexpected target features. Under the guidance of the Target Signatures Working Group (TSWG) develop target models and provide high fidelity signature sets of TMD targets. Evaluate TMD software aimpoint selection, discrimination, and handover algorithms against Dem/Val targets and UOES threats. Provide analysis and recommendations for TMD aimpoint selection, discrimination, and sensor handover. In algorithms, this project develops and analyzes algorithms that have the highest payoff potential for the critical functions of detection, tracking, bulk classification, typing, discrimination, target object map generation, aimpoint selection, and kill assessment. Maintenance and upgrades to the simulation facilities required to develop and evaluate these algorithms against real and simulated data is provided for. The Lexington Discrimination System (LDS) is used to merge radar and optical data analysis on a real-time basis for algorithm development and assessment. Specific tasks include: (1) Use LDS to support development and evaluation of objective system algorithms to be installed on the THAAD and NTW programs; (2) Use signature data to identify robust discriminants

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using field measurements; (3) Develop and deliver individual radar discrimination algorithms based on identified discriminants; (4) Develop, deliver, and exercise on the LDS, algorithms which utilize radar and optical data to facilitate seeker Target Object Map and aim-point selection for TMD systems; and (5) Complete the LDS real-time multiple-sensor, multiple-target handling capability and test TMD algorithms/architectures using this capability.

Modeling. This project provides high confidence, target and background scene predictions for sensors and BMD systems. These generated scenes are the foundation for high confidence simulations of engagements that cannot or will not be flight tested. The high-fidelity, physics-based models, predicted composite scenes, and associated analytic output developed in this task are evaluated against measured data to ensure confidence in simulation results and provide a reliable route to systems verification and validation. To facilitate this objective, this task also provides crucial data-driven software tools for exploiting measured data and integrating measurements with simulations in support of technology development, test and evaluation, and acquisition efforts.

This project also provides for participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and background and plume phenomenology include: U.S./U.K. Scientific Cooperation Research Exchange (SCORE); use of the UK Multifunctional Electronically Scanned Adaptive Radar (MESAR); NATO Extended Air Defense (EAD)/TMD Ad Hoc Working Group - Plume Phenomenology Expert Group (U.S., U.K., France, Canada); U.S./French Bilateral Group - Plumes, Backgrounds, and Reentry Signatures; U.S./Israeli TBM Signature and Phenomenology Research; and the U.S./German Phenomenology Research committee.

FY 1997 ($ in Thousands):

–	$5,310	Data Centers and Management: MDDC and AMSC received, archived, and distributed missile signature test data. Provided required upgrades to data storage and handling tools.
–	$9,857	Data Collection Platform: Provided AST core operating costs for continued optical data acquisition for THAAD, Navy Theater Wide, Navy Area Defense, PAC-3, Willow Dune, and Theater Critical Measurements Program tests.
–	$15,752	Analysis, Algorithms, and Modeling: Continued radar and optical data analysis support for developmental TMD systems. Increased the capabilities of the LDS to include a scenario visualization tool, an interceptor engagement simulation, and incorporated data into the LDS Field Mission Data Base. Upgraded the LDS physical plant to include upgraded memory and rapid prototyping environments. Completed the LDS real-time multiple target handling capability. Developed and analyzed higher order discrimination algorithms using LDS. Upgraded modeling of radar target signatures. Integrated laser signature modeling into the composite modeling framework for radar and infrared signature representations. Delivered and validated signature models for high priority engagement scenarios. Continued participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and background and plume battlespace environments.
–	$30,919	Total

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FY 1998 ($ in Thousands):

- $15,208 Data Collection Platform: Provide AST core operating costs to collect optical data of TMD target development flights and intercepts.
- $15,500 Algorithms and Analysis: Continue data analysis support for TMD systems in Dem/Val and EMD. Provide support for TMD radar/optical discrimination algorithms and architectures for advanced TMD threats and penaids. Develop real-time algorithms for battlefield learning using neural networks, field data, and simulations on LDS. Develop algorithms for real-time sensor resource allocation to support threat-adaptive algorithm architectures.
- $5,256 Models: Deliver validated signature models for high priority engagement scenarios. Continue participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and signature phenomenology.
- $35,964 Total

FY 1999 ($ in Thousands):

- $0 Total

Acquisition Strategy: This project funds data collection platforms, algorithms, and model development through executing agents in the Air Force (Phillips Laboratory), Army (Space and Strategic Defense Command), Navy (Naval Research Laboratory) and OSD (Institute for Defense Analysis) via existing contracts. With the executing agents, free and open competitive contracts will be used to the maximum extent possible.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	31,338	37,835	38,622	144,703
Appropriated Value		37,835		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,377		
b. Internal Realignments		-494		
FY1999 President's Budget	30,919	35,964	0	103,791

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Change Summary Explanation:

Funding: Decrease in FY97 funds was due to reduction of the AST program to offset part of the Congressional requirement to fund the Medium Air Extended Defense System (MEADS). Decrease in FY 98 was due to reduction of project to offset part of the higher priority Department unfunded requirement. FY 98 reduction was also due to transfer of Data Centers and Management to Project 3352. Beginning in FY99, this project is transferred to PE 0603874C.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1155 Discrimination, PE 0603173C	13,800	23,034	21,247	13,908	11,848	4,144	3,556	Cont	Cont

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Navy Area TBMD (formerly Lower Tier) Deliver software releases (optical/radar discrimination)												
CORPS SAM, Sea-based Theater-wide (Upper Tier) - Deliver software releases(algorithms, plumes, backgrounds, optical/radar discrimination algorithms)												
Deliver new software releases (OSC)						X	X	X				
Support BMDO test flight programs		*		*		X		X				
TMD-GBR - Deliver software releases (radar discrimination algorithms)												
THAAD - Deliver software releases (backgrounds, optical discrimination algorithms)		*										
TMD GBR - Deliver software releases (radar discrimination algorithms)			*				X					
Deliver new software releases (SSGM)				*				X				
THAAD - Deliver software releases (background, optical discrimination algorithms)						X						
Initiate BMDO sponsorship of Cobra Gemini system												
Cobra Gemini - provide mission planning and data analysis costs												

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Prime Contracts	20,933	24,152	0
OGA	2,109	2,859	0
Support Contracts	5,887	6,804	0
Program Management	1,990	2,149	0
Total	30,919	35,964	

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
Sverdrop						890	910	0		1,800
Teledyne Brown						7,645	8,598	0		16,243
Colsa						1,503	1,565	0		3,068
Boeing						6,407	11,036	0		17,443
MIT/Lincoln Lab						2,791	2,343	0		5,134
Xontech						1,596	1,171	0		2,767
Nichols Research						1,596	1,171	0		2,767
Photon Research						2,810	2,671	0		5,481
Soarta						1,294	1,211	0		2,505
Miscellaneous						4,387	5,288	0		9,675
Test and Evaluation Organizations										

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management					30,919	35,964			66,883
Subtotal Test and Evaluation									
Total Project					30,919	35,964			66,883

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense PROJECT 1161

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1161 Advanced Sensor Technology	3,299	0	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

The goal of this program is to develop and demonstrate survivability technologies to insure that Theater Ballistic Missile Defense (TMD) systems can perform their mission in all required environments. Ballistic missile defenses must be able to operate in nuclear environments and against countermeasure threats. The requirements for the Survivability program are: define, develop and demonstrate Survivability Enhancement Options (SEO) for TMD systems; develop and transfer SEO technology base to research and development centers and laboratories; provide risk reductions to support THAAD Radar Milestone II.

This program develops and demonstrates survivability technologies to ensure that TMD elements can perform their mission in all expected hostile threats. Approaches include: studies/analyses; defense suppression threat mitigation technologies development; developing enhanced shelters applying camouflage, concealment and deception (CCD), SEO development; Electromagnetic Environmental Effects (E3) engineering support, survivability/operability demonstrations, development of issue resolution approaches; development of Anti-Radiation Missile (ARM) Countermeasure Evaluator (ACE); and hardened technology integration. ACE combines the desirable effects of low-cost digital simulations and hardware testing of actual ARM hardware in open- and closed-loop simulations. ACE will be used to develop initial ARM Electronic Counter-Countermeasure (ECCM) techniques for THAAD/GBR and PAC-3. The multi-spectral signature of the deployed THAAD Radar system requires application of extensive CCD technologies which have been developed by the Army Labs. Technologies will be available for incorporation into core missile defense systems at Engineering Manufacturing Development (EMD), will provide near-term improvements to existing systems, and will provide necessary risk reduction evidence to support THAAD Radar, and Medium Extended Air Defense System (MEADS) system milestone decisions.

FY 1997 ($ in Thousands):

- $3,299 Conducted ACE evaluation of PATRIOT and MEADS TMD radars against countermeasures. Repaired ACE to allow testing of THAAD radar waveforms. Implemented E(3) program and develop NBC guidelines to optimize protection to TMD systems while minimizing cost and weight. Conducted analysis of vulnerability to Precision Guided Munitions (PGM), and analysis of PGM SEO designs. Continued development of TMD survivability technologies in CCD.
- $3,299 Total

FY 1998 ($ in Thousands):

- $0 This project is scheduled to be terminated in FY98 in order to fund higher priority programs within BMDO.
- $0 Total

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FY 1999 ($ in Thousands):

- $0 This project is scheduled to be terminated in FY98 in order to fund higher priority programs within BMDO.
- $0 Total

Acquisition Strategy: The survivability technology program supports the tailored and streamlined acquisition strategy employed by the TMD acquisition managers. Survivability technologies chosen for evaluation/development will be based on requirements. Within the executing agents, free and open competitive contracts will be used to the maximum extent possible to accomplish specific work packages in accordance with field laboratory acquisition procedures. Contract proposals will be evaluated according to innovative technology approaches, responsiveness to program requirements, quality of proposed deliverables, and cost.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	3,334	3,364	3,208	11,176
Appropriated Value		3,364		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		0		
b. Internal Realignments		-3,364		
FY1999 President's Budget	3,299	0	0	4,569

Change Summary Explanation:

Funding: This project is scheduled to be terminated in FY98 in order to fund higher priority programs within BMDO.
Schedule: None
Technical: None

C. Other Program Funding Summary ($ in Thousands)

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	PROJECT 1161

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
ACE eval of GBR												
CCD shelter POP												
E3-THAAD Radar susceptibility guide	*											
THAAD Milestone II			*									
CCD SEO test/trades			*									
ACE eval of MEADS			*									
CCD SEO POP	*			*								
E3 guidelines update				*								
PAC-3 Milestone III				*								
ACE test of BM/C3 SEO suite												
SEO design to counter PGM												
ARM/ECCM for THAAD Radar												
ACE/ECCM for THAAD Radar												
Upgrade CCD technologies												
SEO integration experiment												

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 1161

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Demonstration & Validation	3,299	0	0
Total	3,299	0	0

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
BDM	CPFF	21 Dec 90				1000	0	0	0	1,000
BDM	CPFF					1127	0	0	0	1,127
NRC	CPFF	14 Feb 92				0	0	0	0	
BAH	CPFF	10 Jul 92				0	0	0	0	
TBE	CPAF	6 Mar 92				0	0	0	0	
MICOM	MIPR	Multiple				965	0	0	0	965
Support and Management Organizations										
SSDC	PMA	Multiple				200	0	0	0	200
Misc		Multiple				7	0	0	0	7
Test and Evaluation Organizations										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property								0	
Support and Management Property								0	
Test and Evaluation Property									
Subtotal Product Development					3,092				3,092
Subtotal Support and Management					207				207
Subtotal Test and Evaluation									
Total Project					3,299				3,299

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense PROJECT 1170

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1170 TMD Risk Reduction	22,949	25,987	19,116	20,386	21,899	21,788	21,750	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project is the primary risk mitigation program addressing Theater Missile Defense (TMD) target/threat signature (and the signature-to-system interface) issues for all MDAPs during both their PDRR and EMD phases. This project consists of six elements:

1) the TMD Critical Measurements Program (TCMP), which builds, flies, observes, and analyzes targets similar to foreign threats;

2) the TMD Kill Assessment Program, which provides the technical basis for determining from remote sensor observation whether a TMD target is destroyed by an intercept;

3) the Advanced Seeker Applications Program, which conducts a wide range of laboratory testing and assessment of the latest available seeker technologies, seeker algorithms, and radar-to-seeker handover algorithms using the Seeker Experimental System (SES) in conjunction with the Lexington Discrimination System (LDS);

4) the TMD Target Signature Measurements Program (TSMP), which observes BMDO test targets and analyzes their signatures to provide IR characterization, and which exploits other threat signature opportunities—both radar and IR;

5) Battlefield Learning, which enhances the ability to identify causes of performance degradations observed on the battlefield (primarily resulting from unanticipated threat characteristics) and to rapidly adapt TMD tactics and/or systems to recover system effectiveness; and,

6) Joint Risk Mitigation, which provides a detailed understanding of Jet interaction to provide high fidelity characterization of aerodynamic forces with comprehensive parametric database, test methodologies, and validation of Computational Fluid Dynamics and Semi-empirical models.

The data provided by this project supports the TMD MDAPs in initial design, testing, and P3I in the areas of discrimination, handover, aimpoint selection, divert, and kill assessment. In addition, this project directs and utilizes the Target Signatures Working Group (TSWG) for test planning and analysis. The TSWG was chartered by, and is responsible to, BMDO/AQS. A significant portion of the TSWG is funded through Project 1155.

The purpose of the TMD Critical Measurements Program (TCMP) is to provide tactical ballistic missile target signature and related phenomenology data to mitigate the significant risks associated with the TMD weapon system development. The list of critical data needs for TMD is compiled for the principal TMD functions of target acquisition, bulk filtering and track, discrimination, threat handover, aimpoint selection, interceptor guidance and control, and finally kill assessment. Test requirements for this three flight test program were derived from primarily two sources. The TMD Phenomenology Roadmap Study (2 Mar 94) by the Jamieson Science Group and the TMD elements identified the most pressing data needs that fed into the experiment planning activity. As a result, three flight tests were developed to be conducted at the Kwajalein Missile Range using the KREMS radars and other key ancillary sensors to provide radar and optical data in the following areas of need: resolved infrared (IR) data of an intact missile, exo to low endoatmospheric booster fragmentation, target object maps of closely spaced objects, intact missile intercept debris, tumbling intact missile/warhead, solid fuel debris, simple decoys, inadvertent and crude maneuvering reentry vehicle, and intact missile breakup.

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The TMD Kill Assessment program provides data, analysis, and algorithm development in support of TMD kill assessment and related functions. The program assists the developers of Theater High Altitude Area Defense (THAAD), Navy Area Defense System (NADS), and Navy Theater Wide (NTW) defense in achieving kill assessment requirements specified in the respective Operational Requirements Documents (ORDs). In addition to supporting shoot-look-shoot architectures, the program increases understanding of post-intercept scenes in order to avoid loss of battlespace in both shoot-look-shoot & shoot-shoot architectures. Kill assessment supports the following types of BMC3 decisions: 1) Cease fire following an effective upper tier intercept, in order to preserve interceptor inventory; 2) Additional upper tier shots or salvos following an unsuccessful intercept, when sufficient upper tier battlespace remains; 3) Cueing of lower-tier TMD systems; and 4) Last warning for surface forces. In addition to real-time assessment of the kill effectiveness, the program supports the following:

- Performance assessment to aid in battlefield adaptation;
- Characterization of the post-intercept scene to support algorithm development for post intercept discrimination and targeting by a subsequent interceptor (applicable to both shoot-look-shoot and shoot-shoot architectures); and,
- Characterization of observables with the potential to identify or classify the threat warhead type.

The Advanced Seeker Applications program provides for the application and integration of advanced seeker electro-optical technologies and testing for TMD systems such as THAAD, NADS, and NTW. This work includes system/sensor performance analysis, algorithm evaluation and focal plane technology validation. The primary task is to develop and operate a Seeker Experimental System (SES) which uses IR scene generation for laboratory testing of advanced seeker technologies and support deriving solutions to technical problems arising in TMD interceptor system acquisition programs. The SES provides an independent tool to verify and troubleshoot interceptor electro-optical system/system upgrade performance and risk issues prior to costly in-flight testing and deployment. It also provides risk reduction in radar/seeker interactions by operating in conjunction with the Lexington Discrimination System (LDS) to perform closed loop testing against a variety of threat scenarios; in that mode the SES utilizes target complex scenarios, flight test databases and interceptor/radar interface algorithms available from the LDS and provides LDS with credible seeker data. The SES will also be utilized to assess the effects of BMD in-flight countermeasures or seeker performance, supporting Red Team/Blue Team analysis. A secondary task is to statistically characterize the vulnerability to in-flight heating of sapphire window/dome material to be used in THAAD, Navy Standard Missile, and ARROW optical seekers. The goal of this Sapphire Statistical Characterization and Risk Reduction (SSCARR) program is to collect data to quantitatively predict structural window/dome performance throughout the thermally stressing missile battlespace.

The Target Signature Measurements Program (TSMP) conducts radar and IR signature measurements on BMDO-developed targets and on actual threat TBMs. These data are provided to developers of TBMD systems and of BMDO's targets. This program funds three types of signature data collections and the associated data analysis:

- In-flight infrared (IR) measurements of newly developed BMDO targets. This effort ensures that BMDO targets (e.g., Matching Ballistic Reentry Vehicles (MBRVs)) exhibit their intended characteristics and mitigates the risk of interceptor test failures by providing the TBMD system developers with signatures of targets against which they will be testing. TSMP funds the mission costs for IR measurement assets (High Altitude Observatory (HALO)/Infrared Instrumentation System (IRIS) and Airborne Surveillance Testbed (AST)) to observe selected target flights. Detailed measurement plans for the selected target missions are developed by the Target Signatures Working Group (TSWG) under tasking by the TSMP, using funding from Project 1155. These data are then

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utilized by the TMD system developers, by the TSWG, and by the Targets Program to establish the in-flight signature characteristics of these targets for use in target hardware development, defensive system development, and interceptor algorithm design, test, and assessment.

- In-flight IR measurements on BMDO tests of foreign threat TBMs (e.g., foreign material acquisition (FMA) items such as Willow Dune). This effort optically characterizes real threat TBMs and mitigates the risk of interceptor test failures by providing the TBMD system developers with signatures of FMA targets against which they may be testing. Additionally, this effort mitigates the risk of TBMD intercept failures on the battlefield by providing TBMD system developers with signature data on actual threat TBMs.
- Static radar cross section (RCS) measurements of foreign objects (e.g., FMAs such as Symptom River). This activity mitigates the risk of TBMD intercept failures on the battlefield by providing signature data on FMA items. It also provides data for assessing P3I radar improvements and provides a baseline against which to interpret radar observations of foreign test flights. This activity provides for a comprehensive characterization of the radar threat attributes of real threat items. These data contribute to a robust RCS database that is utilized for discrimination algorithm design, development, testing, and analysis.

The FMA signature measurement activities ensure that the threat attributes, which drive system performance (threat engageability), are adequately characterized and provided to the system developers. This ensures that the resulting operational systems will be able to maintain engageability against the threat and thus preserve system effectiveness.

Battlefield Learning is a new task established to enhance the ability to identify causes of TBMD performance degradations observed on the battlefield (primarily resulting from unanticipated threat characteristics) and to rapidly adapt TMD tactics and/or systems to recover system effectiveness. Given Desert-Storm-like timelines, adapting to an unexpected threat within two days or even less is highly desirable. Two Defense Science Board (DSB) studies advocate improvements in battlefield learning capability. In addition, the Ballistic Missile Defense Advisory Council recommended that we "incorporate adaptability [to threat unknowns] as a fundamental element in the TMD acquisition strategy," saying that this "is likely to be more important than meeting requirements against 'the defined threat'." This program will sponsor technical interchanges between TMD system developers in order to share technical approaches to implementing battlefield learning. In addition, this program will provide the mechanism by which the TMD community will develop a plan for enhancing TMD battlefield learning capability. The plan may include such elements as: 1) Providing a forum for sharing design-for-adaptability approaches between TMD MDAPs; 2) Providing a forum for exposing TMD system developers to rapid adaptability approaches used in other programs (such as ECM programs); 3) Development of tools for adapting discrimination, handover, or aimpoint algorithms to new data; 4) Development of approaches to data sharing in the field across the FoS; 5) Auxiliary sensor asset planning; 6) Development of cross-system tasking agreements; 7) Design of experiments in support of battlefield learning; and 8) Planning for battlefield learning insertion into the MDAP programs.

Joint Risk Mitigation is a new task being established to study the jet interactions that occur between transverse jets in a high speed flow stream. This program was identified by the Army and Navy PEOs as the highest priority joint risk reduction program during the Joint Risk Mitigation Working Group meeting held in December 96. Future interceptors will need increased agility to meet the increasing number of maneuvering Theater Ballistic Missiles (TBMs). This is accomplished with the incorporation of side Divert and Attitude Control Systems (DACS) which allows the TMD systems to successfully engage and intercept TBMs. There is a current need to understand Jet Interaction (JI) forces between the DACS and the high speed flow field. The Joint Risk Mitigation Program will sponsor wind tunnel tests to collect high fidelity data sets of the JI forces and moments on generic configurations. This program will develop a test methodology to be used by the MDAPs for collecting JI data. This program will also offer the ability to validate analytical tools such as Computational Fluid Dynamics Models and Semi-empirical models for use in exploring different configurations of DACS and to build useful control models. In addition to the data sets this program will investigate other JI phenomenon such as the transient

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JI forces, effects of external combustion of solid fuel with the free stream on the Infrared Seeker, effects of actual hot gas combustion and the development of a scaling factor from hot to cold gas data. Various general configurations will be exploited during the configuration tests to be conducted allowing for a high fidelity data set for use in the Semi-empirical model. A comprehensive data set will be collected on the free stream to be used to validate CFD models allowing the MDAPs to better understand and effect changes in autopilot control programs for the interceptor.

FY 1997 ($ in Thousands):

- $15,274 Conducted TCMP 2A and 2C experimental flight test; analyzed, and reported test results. Continued TCMP 3 experimental flight test planning for long and mid-range flights to support THAAD EMD and Navy Upper Tier, and to evaluate potential countermeasures and tactics. Purchased long lead TCMP 3 payload hardware items. Expected launch during second quarter FY99.
- $2,963 Continued to collect and analyze sensor data of intercept tests and transfer kill assessment technology to TMD Major Defense Acquisition Programs (MDAPS); evaluate and upgrade, as required, kill assessment algorithm performance.
- $2,267 Seeker Experimental System measurements were used to analyze handover, discrimination and track performance of Standard missile Block IVA seeker, THAAD InSb focal plane array performance, and preliminary performance analysis of Navy Theater Wide LWIR two color sensor. Continued electro-optical infrared support testing of missile seekers with Seeker Experimental System (SES) and continued the sapphire material test program.
- $2,179 Observed the Willow Dune flight tests, an ATACMS flight test, and the Navy's DTR-1 flight test with the HALO/IRIS and ROBS optical auxiliary sensor data collection assets. Conducted static radar cross section (RCS) measurements on a foreign material acquisition (FMA) item. Completed analysis the SYMPTOM RIVER II FMA item static RCS data and briefed results.
- $266 Jet Interaction program planning
- $22,949 Total

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FY 1998 ($ in Thousands):

- $23,080 Purchase boosters and remaining payload hardware for TCMP 3 flights, focusing on countermeasures and longer range threats. Continue payload fabrication, hardware integration, and sensor planning..
- $0 Continue to collect intercept data and to develop the primary kill assessment algorithms for Engineering Manufacturing and Development (EMD) in support of the THAAD Radar system and Navy Theater Wide program. Complete development of three kill assessment algorithms (blast wave speed, piece size, and RCS polarization). Update kill assessment debris model.
- $917 Use Seeker Experimental System to provide technology assessment for MWIR SM BK IVA focal plane array performance, NTW LWIR focal plane array performance, and THAAD non-uniformity correction techniques. Discrimination performance measurements will be performed for THAAD(booster segmentation issue), Navy Area(complex targets), and NTW(baseline 2 color LWIR).
- $0 Observe the HERA/Maneuvering Target Vehicle demonstration flight test, and two HERA/SX flight tests with the HALO/IRIS optical auxiliary sensor data collection assets. Analyze the FMA item static RCS data. Begin radar cross section variability analysis on TMD threat missile systems.
- $0 Battlefield Learning program planning
- $1,990 Jet interaction program planning, wind tunnel test model development, analysis of transient JI data to understand response times, and computational analysis.
- $25,987 Total

FY 1999 ($ in Thousands):

- $18,572 Complete TCMP-3 hardware integration and testing. Finalize sensor and range support.
- $283 Continue to collect intercept data and test the primary kill assessment algorithms for EMD in support of Navy Upper Tier program. Complete development of first suite of validated kill assessment algorithms.
- $261 Continue target measurements to characterize interceptor targets.
- $19,116 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	23,184	35,267	25,045	125,017
Appropriated Value		35,267		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,132		
b. Internal Realignments		-8,148		
FY1999 President's Budget	22,949	25,987	19,116	110,294

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Change Summary Explanation:

Funding: FY96 funding increased for TCMP for long-lead items for the Fly Along Sensor Package. The FY98 and FY99 funding was reduced to fund higher priority projects.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
TCMP Campaign 2B												
TCMP Campaign 2A, 2C		*										
TCMP Campaign 3 Planning & Preparation		*	*	*	X	X	X	X	X	X	X	X
Complete development of three kill assessment algorithms					X							
Collect and analyze kill assessment data from flight, sled, and gas gun tests	*	*	*	*	X	X	X	X	X	X	X	X
Test kill assessment algorithm suite using THAAD, PAC-3, and ARROW intercept flight data						X	X	X				
Update kill assessment debris model							X					
Update kill assessment algorithm suite								X				
Complete development of first suite of validated kill assessment algorithms											X	

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
THAAD InSb FPA risk assessment report and briefing resulting from the Seeker Experimental System (SES)					X							
Navy Area radar/seeker handover performance evaluation report/briefing resulting from the SES						X						
THAAD handover performance evaluation report briefing from the SES							X					
Navy Theater Wide 2-color seeker discrimination performance evaluation report from the SES								X				
SCCARR database and report						X						
TSMP IR signature collection on the HERA/MTV demonstration flight test					X							
TSMP IR signature collection on the HERA/SX flight tests							X	X				
Static RCS data analysis					X	X	X	X	X	X	X	
TMD threat missile system RCS variability analysis					X	X	X	X	X	X	X	
Battlefield Learning program planning					X	X	X					
Jet Interaction program planning			*	*								
Transient Jet Interaction database								X				
Hot to cold gas scaling data								X				

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A. **Project Cost Breakdown ($ in Thousands)**

	FY 1997	FY 1998	FY 1999
Engineering	21,245	24,227	17,329
Studies	600	700	700
Support	1,104	1,060	1,087
Total	22,949	25,987	19,116

B. **Budget Acquisition History and Planning Information ($ in Thousands)**

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Multiple	Multiple	Multiple				21,845	24,927	18,029	Cont	64,801
Support and Management Organizations										
SSDC	Alloc					1,104	1,060	1,087	Cont	3,251
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					21,845	24,927	18,029		64,801
Subtotal Support and Management					1,104	1,060	1,087		3,251
Subtotal Test and Evaluation									
Total Project					22,949	25,987	19,116		68,052

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BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1294 UAV Boost Phase Intercept	930	0	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

The Unmanned Aerial Vehicle (UAV)-Based Boost Phase Intercept (BPI) project covers two tasks; Task 1: Cooperative UAV-Based BPI project with Israel, and Task 2: Development of a US UAV-Based BPI Concept. Task 1 is a cooperative U.S./Government of Israel (GOI) BPI program which involves future development and refinement (risk mitigation) of the Israeli Boost Phases Intercept System (IBIS) concept which is planned to destroy tactical ballistic missiles in the boost phase of flight, before engine cutoff, preferably while in enemy territory. This project is based on the use of UAVs armed with on-board interceptors to provide the means of destroying enemy missiles in their boosting phase of flight. The first task of this two-part project will provide risk mitigation in the development of the GOI's UAV BPI. Task 2 of this effort develops a U.S. UAV-based BPI system concept. It will develop the system requirements, to include: kinetic energy interceptors, UAVs, search and track sensors, Battle Management, Command, Control, Communications, Computers and Intelligence (BMC4I), and the concept of operations (CONOPS) based on readily available U.S. technologies.

FY 1997 ($ in Thousands):
- $930 See PE0603870C: Continue the risk mitigation effort with the GOI and initiate interoperability efforts.
- $930 Total

FY 1998 ($ in Thousands):
- $0 See PE0603870C
- $0 Total

FY 1999 ($ in Thousands):
- $ Project continuation decision expected in FY98.
- $0 Total

Acquisition Strategy: This project is risk integration for the ABL program. Task 1 of this PMA is a cooperative US/Government of Israel (GOI) risk mitigation effort addressing further MOAB interceptor development, BMC3I, along with intraconstellation communications. The effort is being done under a firm fixed price contract. The US and GOI share costs. Task 2 is being accomplished by BMDO tri-service Integrated Product Teams (IPT). Additional support is provided by industry.

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B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	930	0	0	6,635
FY1999 President's Budget	930	0	0	6,635

Change Summary Explanation:

See PE 0603870C for FY97/98 Funding

Funding: Project funding, structure, and objective directed by Congress

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Complete IBIS Follow-On Report												
Contract Milestone (Israeli) Risk Mitigation			*									
Preliminary US UAV BPI Concept		*										
Israeli Risk Mitigation Final Report										X		

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
IBIS Systems Engineering			
US Systems Engineering	930		
Total	930		

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
SMC	MIPR	Jan 97	157	157		157	0	0	TBD	157
Navy PEO TADB	MIPR	Jan 97	250	250				0	TBD	
NAWC	MIPR					250	0	0	TBD	250
DARPA	MIPR					0	0	0	TBD	
Support and Management Organizations										
WJSA	CPFF	Apr 96				523	0	0	TBD	523
SSDC	MIPR	Sep 96				0	0	0	TBD	
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Govt Property	FP	Jul			0	0	0	TBD	
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					407				407
Subtotal Support and Management					523				523
Subtotal Test and Evaluation									
Total Project					930				930

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COST ($ In Thousands)	FY-1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2160 TMD Existing System Mods	15,819	5,030	2,501	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

CUEING AND NETTING. The overarching objective of the cueing and netting task was to enable the US Marine Corps AN/TPS-59 long-range surveillance radar to accept external cues from, and pass cues to, different theater sensors in order to facilitate theater ballistic missile (TBM) identification, location, and tracking. The effort consisted of the development, testing, and operational demonstration of hardware and software improvements to the radar and other supporting systems which were completed in FY98.

SHIELD (Formerly Talon Shield). The SHIELD program is developing a system that receives and fuses Defense Support Program (DSP) assets, other national intelligence data and SIGINT data on theater ballistic missile (TBM) events to provide more timely warning of worldwide TBM launch point, time, azimuth and impact point prediction to tactical units. As processing improvements and additional sources are integrated and fused, these upgraded capabilities are passed to the Air Force Attack and Launch Early Reporting to Theater (ALERT) and the Army Joint Tactical Ground Station (JTAGS) programs for incorporation in the operational systems. The SHIELD system is co-located at the Joint National Test Facility, Falcon Air Force Base, CO with ALERT.

EXTENDED AIRBORNE GLOBAL LAUNCH EVALUATOR (EAGLE). EAGLE was a complementary effort to SHIELD that would have developed a prototype TBM detection, tracking, and cueing system for demonstration and evaluation aboard Air Force AWACS TS-3 test aircraft. It consisted of a passive infrared search and track sensor and an eye-safe laser radar (Ladar). EAGLE was planned to provide precise cues to deployed GBR and SPY-1 fire control radars as well as improved estimates of TBM launch and impact points. The EAGLE program was canceled as a result of the Theater Airborne Surveillance Study (TASS) recommendation to transfer the EAGLE technology to the Airborne Laser's sensor suite.

AIRBORNE SENSOR FOR BALLISTIC MISSILE TRACKING FY97 Congressional Language mandated funding be moved from "TMD Existing Systems - EAGLE" to "Airborne Sensor for Ballistic Missile Tracking". The language also directed the Under Secretary of Defense for Acquisition and Technology {USD (A&T)} to conduct a study (TASS) and provide a plan to congressional defense committees for developing an airborne sensor capability for ballistic missile tracking. The plan suggested the Airborne Laser sensor be evaluated and modified to conduct a post-boost missile tracking adjunct mission and invested in several airborne sensor system programs designed to increase overall TBM Defense performance. The remaining FY97 funds were allocated to developing an Airborne Laser post-boost adjunct mission capability, TBM Data Fusion Improvements with the SHIELD program (see Task 2), and for a classified TBM Adjunct Mission Study. In FY98, the Airborne Sensor for Ballistic Missile Tracking effort continued the SHIELD TMD Data Fusion Improvements, development for the TBM Adjunct Mission, and airborne sensor work associated with the Low Cost Autonomous Attack System and the Airborne Laser program.

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FY 1997 ($ in Thousands):

- $40 CUEING AND NETTING. Developed AN/TPS-59 hardware and software modifications to accept an external cue and conducted developmental testing of cueing and netting capability at SIT 97.
- $4,328 SHIELD. Continued SHIELD development test and evaluation activities; continued to incrementally develop, test and demonstrate improved processing capabilities and fusion of other intelligence and sensor data sources with DSP.
- $7,785 EAGLE. Completed efforts initiated in FY 1996. Characterized sensor performance under conditions more characteristic of the operational environment against TBM targets of opportunity and surrogate targets prior to prototype integration on the AWACS TS-3 test aircraft.
- $3,666 AIRBORNE SENSORS for BALLISTIC MISSILE TRACKING - Sensor improvement programs for Joint STARS and Ladar/ IRST sensor design and development requirements, ABL technology transfer, and conduct TBM adjunct mission studies.
- $15,819 Total

FY 1998 ($ in Thousands):

- $313 CUEING AND NETTING. Conduct an operational demonstration of the TPS-59 capability to accept and pass an external cue. Conduct an operational demonstration of fusing infrared and radar data to improve impact point predictions and reduce impact ellipse size.
- $2,815 SHIELD. Continue SHIELD development, test and evaluation activities; continue to incrementally develop test and demonstrate improved processing capabilities and fusion of other intelligence and sensor data sources with DSP. SHIELD and ALERT processors will be able to accept multiple data inputs from DSP, OTHER, and ADDITIONAL infrared and radar sensors.
- $1,902 AIRBORNE SENSORS for BALLISTIC MISSILE TRACKING. Continue development of sensor improvement efforts and mission studies for Joint STARS, Ladar/ IRST sensor development, and data fusion development and test.
- $5,030 Total

FY 1999 ($ in Thousands):

- $2,501 SHIELD: Continue SHIELD development, test and evaluation activities; continue to incrementally develop test and demonstrate improved processing capabilities and fusion of other intelligence and sensor data sources with DSP. Infrared and data fusion efforts will culminate with operational code for ALERT and Space Based Infrared System Increment 1 capabilities.
- $2,501 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	22,421	12,328	12,957	68,107
Appropriated Value		12,328		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-352		

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	FY 1997	FY 1998	FY 1999	Total Cost
b. Internal Realignments		-6,946		
FY1999 President's Budget	15,819	5,030	2,501	43,702

Change Summary Explanation:

Funding: FY97-FY99 funding was reduced to support higher priority projects. FY97 Airborne Sensor funding also absorbed a Congressional rescission.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands) (None)

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Complete	Total Cost
								N/A

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
CUEING AND NETTING												
Acquisitions milestones		*										
Engineering milestones			*		X							
Test and Demos				*		X	X	X				
EAGLE												
Design Review Technical Interchanges	*	*										
Engineering Milestone												
Component Ground Lab Test	*	*										
Lab and Field Ground Test	*											
Prototype Flight Test		*										
Studies, Phenomenology												
Review & Analyze Test Data												
Technology Transfer				*	X							
International Participation Negotiations	*											
SHIELD												

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones	*				*				X			
Engineering Milestones			*			X		X				
Upgrade Reviews	*	*	*	*	*	X	X	X	X	X	X	X
T&E Milestone					X		X		X			
Test and Demos	*	*	*	*	*	X	X	X	X	X	X	X
AIRBORNE SENSORS for BALLISTIC MISSILE TRACKING												
Engineering Milestones												
Software Development				*								
Hardware Development												
Test and Demos		*			*	X	X	X				
Review and Analyze Data			*	*			X	X	X			

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Engineering	14,621	4,723	2,501
Studies	1,198	307	0
Total	15,819	5,030	2,501

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
ESC	MIPR					10,451	707	0		11,158
SMC	MIPR					4,828	4,010	2,501		11,339
ADS	MIPR					40	313	0		353
ASC	MIPR					500	0	0		500
Support and Management Organizations										
Test and Evaluation Organizations										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense	PROJECT 2160

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					15,819	5,030	2,501		23,350
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project					15,819	5,030	2,501		23,350

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 2259

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2259 Israeli Cooperative Project ***	42,393	50,573	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

This project includes the Arrow Deployability Project (ADP), the Israeli Test Bed (ITB), Israeli Cooperative Research & Development (R&D), and the Israeli System Architecture and Integration (ISA&I) Project. The U.S. derives considerable benefits from its participation in these projects. The primary benefits are in U.S. gains in technology and technical information that will reduce risks in U.S. TMD development programs. The U.S. also benefits from the eventual presence of an anti-ballistic missile defense system in Israel, which provides deterrence of future tactical ballistic missile (TBM) conflicts in that region. This defensive system also contributes to a more robust defensive response should deterrence fail.

The Israeli / Arrow program consists of efforts to develop a ballistic missile defense system for Israel. It includes the U.S.-Government of Israel (GOI) initiative to assist the GOI development of an anti-tactical ballistic missile (ATBM) interceptor and launcher. The program also includes an Israeli developed fire control radar (Green Pine), fire control center (Citron tree) and launch control center (Hazelnut Tree). Comprised of three phases, this initiative began with the Arrow Experiments project (Phase I) that developed the preprototype Arrow I interceptor. Followed by the ACES project (Phase II) which is a continuation of Phase I, and consists of critical lethality tests using the upgraded Arrow II interceptor. Arrow provides the basis for an informed GOI engineering and manufacturing decision for an ATBM defense capability. If successful, the Arrow II will satisfy the Israeli requirement for an interceptor for defense of military assets and population centers and will support U.S. technology base requirements for new advanced anti-tactical ballistic missile technologies that could be incorporated into the U.S. theater missile defense (TMD) systems.

The third phase is the ADP, which began in Fiscal Year 1996. This phase of the project will pursue the research and development of technologies associated with the deployment of the Arrow Weapon System (AWS) and will permit the GOI to make a decision regarding deployment (without financial participation by the U.S. beyond the R&D stage). This effort will include system-level flight tests of the total Arrow Weapon System. An interface will be developed for AWS interoperability with U.S. TMD systems. Lethality, kill assessment and producibility will continue to be assessed. Subsequent U.S.-Israeli cooperative R&D on other ballistic missile defense concepts may occur in the future.

The ITB Program is a medium-to-high fidelity theater missile defense simulation that provides the capability to evaluate potential Israeli missile defenses, aids the Israeli Ministry of Defense (IMOD) in the decision of which defense systems to field, provides insights into command and control in TMD, and trains personnel to function in a TMD environment. A structured set of joint U.S./Israeli experiments is being executed to evaluate the role of missile defenses in both mature and contingency Middle East theater operations. This funding also provides for a portion of the operation and maintenance of the ITB and for planned enhancements. Completed experiments identified additional enhancements needed to improve the ITB as an analysis tool. The enhancements incorporated in the ITB to date include

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radar and weapons models, and a Boost Phase Intercept (BPI) simulation capability. The BPI enhancement benefited the Israeli BPI study completed in January 1996. The Adaptive Battle Management Center (ABMC) enhancement benefits the U.S. by enabling the ITB to simulate a wide variety of command and control and interoperability issues. The planned inclusion of the Distributed Interactive Simulation (DIS) will enable joint exercise experiments to be conducted both in Israel and across the water between US TMD and IS TMD systems.

The Israeli Cooperative R&D program supports the advancement of emerging TMD technologies. This support will advance the technology demonstration phase which will provide for the defense of the State of Israel. It further supports the U.S. technology base needs for these technologies, and furthers the pursuit of interoperability with U.S. TBMD systems. This task supports efforts in developing an interface to allow for interoperability between Israeli TMD systems and U.S. TBMD systems and the implementation of such a system.

The ISA&I tasks provide ongoing analysis and assessment of the baseline, evolutionary, and responsive threats to support the definition and evaluation of an initial Israeli Reference Missile Architecture (IRMA), a baseline missile configuration. Evolutionary growth paths to enhance the IRMA robustness against future threats will be identified. Critical TMD system architecture issues and technologies will be analyzed, and the conformance to established requirements of various Israeli anti-tactical ballistic missile (ATBM) programs, including the Arrow missile development activity, the ADP, and the ITB will be conducted. Finally, previously developed simulations and models will be used selectively to address significant TMD issues. Collectively, the tasks conducted under this cooperatively sponsored ISA&I project will provide critical insights and technical data to both the U.S. and Israeli governments for improving near-term and evolutionary defenses against ballistic missile threats.

Since program initiation in 1988, Israel successfully improved the performance of its pre-prototype Arrow I interceptor to the point that it achieved a successful intercept and target destruction in June 1994. Arrow II design and component testing progressed to the successful demonstration of the new warhead, electro-optical seeker, radar fuse, first stage booster, sustainer booster, launcher canister, and launcher. The ADP International Agreement was signed in March 1996 and Presidential certification was completed in May 1996.

The ITB became operational in the second quarter of FY 1992. The ITB experiments validated the performance of the prospective near-term Israel Theater Missile Defense System. It provided valuable insight into the potential role of Human-In-The-Loop (HIL) for a TMD system. Also, the Test bed Product Office at the Space and Strategic Defense Command benefited from the application of ITB Project experience to the U.S. and United Kingdom Extended Air Defense Test Bed (EADTB) Projects. The ITB is being utilized to determine Combined Standard Operating Procedures (CSOP) between the US and Israel for TMD.

The ISA&I Project activities demonstrated that defense of the State of Israel from tactical ballistic missile (TBM) attacks is feasible and cost-effective. The ISA&I effort analyzed and addressed numerous TMD system issues including HIL, resource allocation, and threat analysis. The U.S. benefited from the architecture analysis work, including identification and progress toward resolution of critical TMD system issues such as kill assessment and the lethality study of a novel interceptor warhead.

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FY 1997 ($ in Thousands):

–	$1,701	ACES Support. Continued Arrow II test support. Completed lethality analysis of Arrow II. Evaluate Arrow II performance against surrogate threat High Explosive and bulk chemical warhead targets. Continued analysis of Arrow II flight test data. Provide Arrow II flight data to U.S. TMD interceptor developers.
–	$35,000	Arrow Deployability Project and Support. Began production of Arrow II UOES and targets. Began integration of the total AWS. Evaluated AWS interoperability with US TMD systems. Evaluated expected Arrow Weapon System (AWS) test performance. Provided AWS test plans and flight data to U.S. TMD developers.
–	$2,700	ITB. Completed Adaptive Battle Management Center enhancements. Conducted experiments on near-term improvements to the TMD system. Continued HIL experiments and CSOP for combined operations.
–	$1,500	ISA&I. Provided independent oversight and assessment of near-term TMD system to include capability conformance with operational requirements and test plan traceability with operational specifications. Conducted architecture effectiveness/cost/risk trade study to examine evolution from near-term TMD system.
–	$142	Gov Project Personnel & Support. Provided funding for project support from USASSDC personnel.
–	$1,350	Provided project support to emerging TMD technologies. Provided support to US-IS Interoperability tasks. Provided proof of concept operations testing.
–	$42,393	Total

FY 1998 ($ in Thousands):

–	$47,042	Arrow Deployability Project and Support. Continue AWS integrated flight tests. Evaluate U.S. and Arrow components for electro-magnetic interference. Transfer the results of the AWS tests to U.S. TMD interceptor developers. Continue interoperability, lethality, kill assessment and producibility studies. Develop an US/Israeli Interoperability Capability.
–	$1,894	Continue ITB experiments on near-term improvements to the TMD system and on deployability. Provide improved threat model and Arrow II update enhancements. Continue supporting CSOP requirements.
–	$1,495	ISA&I. Analyze results of ITB Interoperability experiments. Continue evaluations of the performance of the near-term TMD system based on ADP system flight tests. Continue analysis of TMD refinements for future threats.
–	$142	Gov Project Personnel & Support. Provide funding for project support from USASSDC personnel.
–	$50,573	Total

FY 1999 ($ in Thousands):

–	$	
–	$0	Total

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Acquisition Strategy: This is a cooperative U.S./GOI development program. By completing the Arrow Deployability Project, U.S. TMD programs will be afforded state-of-the-art technical data for program risk reduction and the GOI will have developed information to make a sound Arrow Weapon System deployment decision. The planned ISA&I and ITB efforts will continue to refine the operational tactics and techniques of the fielded near-term TMD system. The U.S. and the GOI, under the umbrella of the various Memoranda of Agreements, share project costs. The U.S. share of total funding is based upon the maturity of the development. Each contract associated with the individual projects is a firm-fixed price (FFP) contract.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	43,892	38,715	38,662	180,621
Appropriated Value		50,715		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,911		
b. Internal Realignments		+1,769		
FY1999 President's Budget	42,393	50,573	0	152,143

Change Summary Explanation:

Funding: The FY1997 Congressional Appropriation contained an additional $3.7M for the Israeli Cooperative Programs. The program was then reduced for Department of Defense-Wide RDT&E reductions. Inflation reductions impacted FY1998 and beyond to levels below the $40M per year specified in the US/Israel Memorandum of Agreement (Kaminski-Eilam). This project has been transferred to PE 0603875C starting in FY1999.

Schedule: Out of three flight tests planned in FY97, two occurred in FY97, and one will occur in FY98.

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3359 - System Test & Evaluation, PEs 0603872C/0603873C	39,575	47,928	36,148	67,037	55,222	69,579	63,110	Cont	Cont

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
U.S./Israel ADP Agreement signed												
Complete Arrow Interceptor Development						X						
Complete ITB Enhancements		*		*			X		X			
Complete three Arrow II Flight Tests (ACES)		*		*		X						
Initiate Arrow Weapon System Flight Tests								X				
Initiate Interoperability Requirements	*											
Interoperability Tests							X			X		X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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	PROJECT 2259

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Prime Contract (Israel Ministry of Defense)	33,000	44,750	
Other U.S. Government Activities	4,150	2,292	
US Government Flight Test Support	1,701	0	
Software Development	1,900	1,894	
Systems Engineering	1,500	1,495	
Miscellaneous	142	142	
Total	42,393	50,573	

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
Test and Evaluation Organizations										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3153

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3153 Systems Architecture and Engineering**	9,051	7,942	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

In January 1997, the BMDO Director established the Office of the Chief Architect/Engineer. This reorganized project ensures that appropriate issues relating to Joint Systems Architecture and Engineering (JSAE) are addressed in a coordinated and synergistic manner across all National Missile Defense (NMD) and Theater Air and Missile Defense (TAMD) efforts. The office reports directly and independently to the BMDO Director to provide the necessary mission-area oversight of critical BMDO technical issues.

Within this project, the BMDO critical JSAE tasks are divided into the areas of Joint Systems Analysis; Baseline and Risk Management; Interfaces and Interoperability (Battle Management/Command, Control, and Communications (BM/C3)); Modeling and Simulation (M&S) Requirements and Standards; Developmental Planning; and Test and Evaluation (T&E). The project provides BMDO with a technical assessment of the expected effectiveness of major programs under development and requirements for supporting technology. Through FY98, the work is funded through two program elements, one for TAMD and the other for NMD.

This program element focuses on TAMD systems and technology. The primary thrust of the work is to show analytically the need for and expected performance of different defense systems under development to handle current and projected threats. The systems-level architecture/engineering analysis supports efforts to determine the expected operational performance and effectiveness of missile defense systems under development. Models and simulations are used to investigate architecture and system level capability and to resolve critical technical issues related to the development of specific elements of the architecture. Tradeoffs in alternative elements, specific designs, inventory and integration of systems are conducted to determine the most cost effective approach for a particular missile defense mission. Analysis is performed on a continuing basis in order to determine the impact of changing threats, mission requirements, and technological advances. The remaining core JSAE efforts focus on integrating ongoing efforts across the TAMD and NMD mission areas and developing and implementing policies designed to enhance system and cost performance. These efforts help to reduce system and architectural risks, improve system interoperability, focus technology planning and prioritization, and integrate T&E and M&S efforts.

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	PROJECT 3153

FY 1997 ($ in Thousands):

- $5,401 Architecture/Engineering Analysis: Conducted annual program update study (PROGRUS IV). Continued systems analysis of architecture/system performance and related technical issues as directed by Congress, the Department of Defense, the BMDO Director, and the Chief Architect/Engineer. Developed the BMDO technology roadmap.
- $2,392 BM/C3: Provided BMDO system-level capability to address emerging BM/C3 system requirements and concerns in a synergistic manner across all NMD and TMD development efforts and facilitated the translation of operational BM/C3 requirements to joint and combined interoperable systems. Coordinated BMDO participation in the analysis, development, and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO NMD/TAMD BM/C3 development. Participated in the revision to the DoD JTA version 1.0 and assessed the BMDO's compliance to the Open Systems approach.
- $1,258 Test and Evaluation: Supported development of the BMDO testing evaluation reports; verified program requirments flow into test and experiment objectives; conducted T&E Steering Group (TESG) and BMD Operational Test and Evalution Council (BOTEC) meetings; and tracked test and experiment events and produced the Test and Experiment Activities Summary (TEAS).
- $9,051 Total

FY 1998 ($ in Thousands):

- $4,702 Architecture/Engineering Analysis: Develop an overall analysis plan for the BMDO and oversee the analysis process. Participate in engineering trade studies with the TAMD systems engineer. Perform commonality studies on the Upper Tier TMD systems. Continue systems analysis of architecture/ system performance and related technical issues as directed by Congress, the Department of Defense, the BMDO Director, and the Chief Architect/Engineer. Direct the Joint Systems Engineering Team (JSET). Manage the systems technology implementation process and develop pre-planned program improvement requirements.
- $3,240 Architecture/Engineering Core: Lead BMDO JSAE efforts to develop strategies, policies, and processes. Provide BMDO system-level capability to address emerging system requirements and concerns in a synergistic manner across all NMD and TAMD development efforts and facilitate the translation of operational requirements to joint and combined interoperable systems. Lead BMDO participation in the development and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO NMD/TMD BM/C3 development. Participate in the development of JTA version 2.0; conduct JTA compliance engineering; hold TESG and BOTEC meetings; oversee HLA compliance and migration; and produce the BMDO Open Systems Assessment and the TEAS.
- $7,942 Total

FY 1999 ($ in Thousands):

- $0 This project has been transferred to PE 06043874C starting in FY99.
- $0 Total

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	PROJECT 3153

Acquisition Strategy: Systems analysis work in this project is contracted. In November 1995, a two year competitive contract for this work (with two, one year extension options) was awarded to a ten-member corporate team. For other JSAE efforts, expertise of Government, Federally Funded Research & Development Center (FFRDC), System Engineering and Integration Contractor (SEIC), and Scientific, Engineering and Technical Assistance (SETA) personnel are leveraged in the execution of project activities, using existing contracts to the maximum extent possible. Specifically, U.S. Army Space and Missile Defense Command (USASMDC) and USAF/Electronic Systems Center (ESC) Government and contractor personnel lead Information Architecture and development efforts; SETA and SEIC contracts provide the core of technical expertise for a variety of JSAE activities; and FFRDC contract vehicles provide state-of-the-art technical expertise in Software Engineering and related technical areas. Additional contractor services will be procured if needed to meet emerging program requirements.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	6,799	8,273	8,099	32,909
Appropriated Value		8,273		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-361		
b. Internal Realignments		+30		
FY1999 President's Budget	9,051	7,942	0	27,205

Change Summary Explanation:

Funding: This project has been transferred to PE 0603874C starting in FY99.

Schedule: None

Technical: In January 1997, the BMDO created the office of the Chief Architect/Engineer, incorporating activities previously funded in this project and adding additional JSAE responsibilities.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program, PE 0603871C	1,989	2,895	0	0	0	0	0	Cont	Cont
3153 Systems Architecture and Engineering, PE 0603874C (TMD and NMD combined)	0	0	17,228	16,591	16,780	16,991	17,053	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense PROJECT 3153

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Define BM/C3 elements												
Assess TMD/NMD/TAD Architectures												
Assess Global Command and Control System (GCCS) Interoperability in support of the Technical Architecture												
Develop Commander-in-Chief (CINC)/ User BM/C3 Feedback Plan in support of the Technical Architecture												
Establish BMD BM/C3 CARD like document												
Establish Architecture Baseline Configuration Control Process						X						
Participate in JTA ver. 2.0 development		X	X	X	X							
JSET Upper Tier Commonality Studies					X	X	X	X				
Test and Experiment Activities Summary		X	X	X	X	X	X	X				
BMDO Open Systems Assessment		X		X		X		X				
TESG		X	X	X	X	X	X	X				
BMDO JTA Annual Report				X				X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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	PROJECT 3153

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Engineering Analysis	5,401	4,702	0
JSAE Core	3,650	3,240	0
Total	9,051	7,942	

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
BDM	CPFF/CPAF	27 Dec 94				2,120	1,318	0	0	3,438
SPARTA	CPFF					5,401	4,447	0	0	9,848
SRS	CPFF					1,058	800	0	0	1,858
Other Support		Multiple				472	1,377	0	0	1,849
Test and Evaluation Organizations										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management					9,051	7,942			16,993
Subtotal Test and Evaluation									
Total Project					9,051	7,942			16,993

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3157

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3157 Environmental, Siting, and Facilities	5,047	3,097	2,604	2,496	2,619	2,462	2,402	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

Provides environmental program guidance, environmental impact analyses and documentation, real property facility siting, acquisition, and facility operational support for the Ballistic Missile Defense Organization (BMDO) Theater Missile Defense (TMD) system. Plans, programs, budgets, and oversees facility acquisition through the Military Construction (MILCON) and RDT&E construction programs. Provides guidance and supports BMDO TMD Environmental Assessment and Environmental Impact Statement process, environmental compliance, pollution prevention, and other environmental efforts for TMD activities. Develops guidance for Executing Agents on facilities, siting, acquisition, and environmental matters.

FY 1997 ($ in Thousands):

- $1,878 Supported TMD programs with siting analyses, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. The project covered costs associated with maturing acquisition programs, fielding of systems, integrated system testing, and test and evaluation programs.
- $144 Continued facility planning for fielding the PAC-3 and THAAD systems. It also continued facility planning support for test and evaluation programs.
- $2,990 Provided funds to execute and manage TMD's FY 97-99 MILCON, Minor MILCON, and RDT&E facility design, and construction. Designed projects include: the Multi-purpose Missile Test Facility at USAKA, Utilities Repairs at Wake Island , and Extended Range Target Launch Complex facilities. Construction projects included PAC-3, and THAAD facility projects, such as: TMD Target Launch Facilities at Wake Island and Fort Wingate, PAC-3 Missile Assembly Building at White Sands Missile Range, and the THAAD 1st Objective Battalion Facilities at Fort Bliss.
- $35 OSD and SBIR Reductions
- $5,047 Total

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FY 1998 ($ in Thousands):

- $1,531 Support TMD programs with siting analyses, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. Begin work on the System Integrated Tests requirements development and continue on the Navy Area, THAAD and PAC-3 systems. The program manages activities associated with maturing acquisition programs, fielding of systems, integrated system tests, and test and evaluation programs.
- $62 Complete facility planning for PAC-3 and THAAD facilities. Begin planning and development of unique range test facilities for both Atlantic and Pacific requirements. Complete planning for the FY00 and FY01 System Integration Tests.
- $1,504 Provides funds to execute overall FY98-00 MILCON, Minor MILCON, and RDT&E facility design, construction projects and related activities. Construction projects include: Multi-purpose Missile Test Facility at USAKA, Repair Essential Launch Facilities at USAKA, and Facility Upgrades at PMRF. Continual improvements to TMD's test and evaluation facilities are required to support the ever increasing complexity of test scenarios. Initial requirements to meet improvements to PAC-3, THAAD and Navy Area system will enter the design phase.
- $3,097 Total

FY 1999 ($ in Thousands):

- $1,276 Support BMDO TMD programs with siting analysis, basing deployment plans, environmental analyses and documentation, environmental compliance and pollution prevention programs, and test range studies. Work continues on new BMDO requirements as well as on Navy Area, Navy Theater Wide, THAAD and PAC-3 systems to meet their requirements. The program manages activities associated with maturing acquisition programs, fielding of systems, integrated system tests, and test and evaluation programs.
- $63 Complete facility planning for Navy Area and PAC-3 system facilities. Continue planning and development of unique range test facilities for both Atlantic and Pacific requirements as well as follow-on improvements to THAAD and Navy Area systems. Complete planning for the FY00 and FY02 System Integration Tests.
- $1,265 Provides funds to execute overall FY98-00 MILCON, Minor MILCON, and RDT&E design and construction. The design emphasis will be on completing facility requirements for PAC-3 and THAAD systems. Provides for TMD test and evaluation facilities improvements to support increasingly complex test scenarios. Final requirements to meet improvements to PAC-3, THAAD, and Navy Area system will enter the design phase. The construction emphasis will be on the facilities upgrades at Pacific Missile Range Facility and other ranges where System Integration Test will occur.
- $2,604 Total

Acquisition Strategy: BMDO is assisted by executing agents in the Army, Navy, Air Force and contractor support. They provide technical assistance of facilities, siting, and environmental activities. The U.S. Army Space and Strategic Defense Command, U.S. Army Corps of Engineers, the U.S. Army Program Executive Office-Missile Defense and Navy PEO Theater Air Defense provide specific additional technical assistance in delivering the Facilities, Siting, and Environmental documentation products needed for program execution. BMDO tasks the Services through Program Management Agreements to perform the required tasks in support of the TMD program. BMDO performs quarterly on-site reviews to verify and validate completed tasks.

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B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	5,972	3,600	3,640	17,581
Appropriated Value		3,600		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-117		
b. Internal Realignments		-386		
FY1999 President's Budget	5,047	3,097	2,604	16,952

Change Summary Explanation:

Funding: Resources for this project have been reduced based on revised BMOD FY99-03 program priorities.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3157 Minor MILCON & Design, Joint TMD Dem/Val, PE 0603872C	1,404	1,965	1,885	1,444	341	1,643	1,650	Cont.	Cont
2260 Major MILCON Projects, Dem/Val, PE0603872C			4,600				4,994	Cont	Cont

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 3157

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
PAC-3 and THAAD Target Launch Facilities, Ft Wingate and Wake Island	*	*	*	*								
PAC-3 Missile Assembly Bldg, White Sands Missile Range	*	*	*	*	X							
Multi-purpose Missile Test Facility, Kwajalein Atoll	*	*	*	*	*	*	*	*	X	X	X	X
THAAD 1st Objective Battalion, Ft Bliss	*	*	*	*	X				X			
Manage Environmental Analysis for Eglin Gulf Test Range	*	*	*	*	X	X	X	X	X	X	X	X
Manage Environmental Analysis for Pacific Missile Range Facility	*	*	*	*	X	X	X	X	X	X	X	X
Manage Environmental Analysis for Long Range Air Launch	*	*	*	*	X							
Repair Transient Housing, USAKA		*	*	*	X	X						
Master Planning for THAAD 2nd Objective Battalion									X	X	X	X
Environmental Analyses for Advanced Interceptor Technology								X	X	X	X	X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Environmental, Siting & Facilities	5,047	3,097	2,604
Total	5,047	3,097	2,604

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Navy Civil Engr/Environ Staff	CPFF	FY96				50	50		Cont.	100
USASSDC	CPFF	FY96							Cont.	
WSMR Environ Staff	MIPR	FY96				175			Cont.	175
MICOM-RDEC	MIPR	FY96				25	25		Cont.	50
PEO-AMD-TSD-Civil	PMA	FY96				30	30		Cont.	60
Air Force, 46 Ops Group, Eglin AFB	MIPR	FY96				1,168	643	386		2,197
Miscellaneous						1,569	749	800		3,118
Support and Management Organizations										
AF SMC	PMA	FY96				20	20	20		60

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Huntsville Corps of Engr	MIPR	FY96				130	130	150	Cont.	410
PEO-AMD-TSD Support	CPFF	FY96				676	400	400	Cont.	1,476
MEVATEC	CPFF	FY96				100	100	100	Cont.	300
Navy Environ. Support	CPFF	FY96				304	150		Cont.	454
SETA (BMDO)	CPFF	FY95				800	800	748	Cont.	2,348

Test and Evaluation Organizations

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

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Subtotal Product Development	3,017	1,497	1,186	5,700
Subtotal Support and Management	2,030	1,600	1,418	5,048
Subtotal Test and Evaluation				
Total Project	5,047	3,097	2,604	10,748

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	PROJECT 3160

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3160 TMD Readiness	1,692	0	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

This project supports Theater Missile Defense projects in the functional areas of manufacturing, logistics supportability and metrology design and support. These diverse functions map directly into meeting operational suitability and affordability goals. By focusing on all TMD (BMD) activities and coordinating these efforts between the Services and projects, common cost avoidance is realized. TMD readiness activities include producibility and planning for manufacturing, acquisition logistics, metrology, and training. The efforts will concentrate on identifying and analyzing critical TMD systems level deployment, support, producibility and manufacturing (P&M) risks, industrial base capability issues and developing mitigation plans for these areas to ensure operational requirements and BMDO affordability objectives are met. In addition, TMD operational suitability and availability advances and lessons learned are applied to NMD projects. This effort will also focus on the identification of critical TMD metrology requirements; and the development of national/DOD measurement standards and calibration support for TMD technology and acquisition programs.

FY 1997 ($ in Thousands):

- $791 Completed the NIST medium background IR calibration facility. Continued development of IR standards for Medium Wave Infrared (MWIR) detectors, focal plane array testing, and IR filter measurements. Continued NIST support of THAAD Radar antenna field diagnostics and calibration. Continued to support the TMD program offices, their contractors, Government laboratories and test centers with IR calibration and measurement services.
- $485 Supported completion and insertion of producibility and manufacturing mitigation programs developed in FY95 and 96, including non-BMDO programs. Supported element program offices in risk mitigation development and assessment.
- $416 Updated operational suitability planning, to address issues related to TMD concepts of operations, BM/C3, inter-Service operations, and systems readiness and functional requirements.
- $1,692 Total

FY 1998 ($ in Thousands):

- 0 This project is scheduled to be terminated in FY98 in order to fund higher priority programs within BMDO.
- $0 Total

FY 1999 ($ in Thousands):

- 0 This project is scheduled to be terminated in FY98 in order to fund higher priority programs within BMDO.

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– $0 Total

Acquisition Strategy:

a. Efforts to develop and implement metrology standards will be executed by the NIST. BMDO funding will be administered by the AF Metrology Center in Newark OH. The AF Metrology Center staff also have the responsibility of helping BMDO identify metrology needs and implementing and distributing developed standards through-out US industry.

b. Efforts in producibility and manufacturing , industrial base analyses, and operational suitability will be worked through a series of government managed working groups and IPTs. Efforts may be executed by BMDO SETAs, Service Industrial base Analyses organizations, Service training and planning organizations. Unless a significant, multi-year effort is required on a particular issue, these areas will be worked via MIPRs to services and by funding tasks with existing BMDO and service SETAs. These limited funds will go to the organization with the expertise on a topic -by-topic basis.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	1,709	1,730	1,692	6,243
Appropriated Value		1,730		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		0		
b. Internal Realignments		-1,730		
FY1999 President's Budget	1,692	0	0	2,804

Change Summary Explanation:

Funding: Project scheduled for termination in FY98.
Schedule: None
Technical: None

C. Other Program Funding Summary ($ in Thousands)

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

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	PROJECT 3160

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
IR and improved IR dynamic range spectral calibration services are provided throughout other milestones (TBD)												

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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	PROJECT 3160

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Integrated Logistics Support	1,692	0	0
Total	1,692	0	0

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense PROJECT 3251

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3251 Systems Engineering and Technical Support*	45,536	62,861	19,974	24,871	20,813	23,020	22,396	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project provides system engineering and technical support for the integration of Service-supplied weapon systems to facilitate the identification and resolution of inter-Service integration and interoperability issues; technical and engineering assessments and trade-off studies of Theater Missile Defense (TMD) system architectures and concepts; support for UK developed sensor data fusion methodology; Ballistic Missile Defense (BMD) system survivability oversight and assessment; risk reduction and acquisition streamlining support; modeling, simulation, experiment, and flight test support; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation associated with TMD studies and critical issues.

FY 1997 ($ in Thousands):

- $891 Continued UK sensor data fusion efforts including Target Oriented Tracking System (TOTS) integration testing and development and testing of TOTS applications. Began use of TOTS in test analysis at various BMD test ranges.
- $8,467 Provided scientific, engineering, and technical support for the acquisition, integration, and fielding of TMD systems including: review of products in comparison to standards, specifications, and requirements; modeling and simulation support of architecture analyses and trade-off studies; risk reduction and acquisition streamlining support; engineering and technical support for international programs and BM/C3 efforts; conducted EADTB distributed analyses and operations; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation.
- $1,460 Provided support for the TAMD ACQ Study and for a classified project.
- $12,834 Using FFRDC resources, performed independent technical and engineering assessments of TMD system architectures including: system concept development and assessment; critical element technical and programmatic assessments including trade-off analyses; reviews of mandated documents, international cooperative programs, and treaty implications; multi-Service and allied BM/C3 integration; modeling, simulation, experiment and flight test support; integration of fielded components into operational units; and specific studies and analyses of critical issues.
- $11,450 Increased system engineering and integration support at the TMD system level. Continued to identify inter-Service integration interfaces; prepared engineering documents to identify changes required in theater air defense C3I systems to support TBMD; updated TMD Integrated Test Plan; updated system description documents; and planned, coordinated, and analyzed C2 wargames for CINC CONOPS development.

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–	$6,707	Provided support to Service integration, interoperability, and resolution of interface issues; determined adequacy of threshold/objective hardness specifications for C4I support equipment; identified SEOs for C4I/support equipment to meet/exceed identified exposure levels to ensure critical operational effectiveness; continued environmental modeling and simulation tool improvements; assisted in coordinating technology infusion to support pre-planned product improvements; continued support to TMD program offices in refining software development practices and mitigating technical, cost, and schedule risks across BMD/TMD software development, integration, testing, and maintenance efforts.
–	$1,499	Supported BMDO services (e.g., security, contracting, supplies).
–	$2,007	Provided technical support to Combat Developments Directorate-Ft Bliss, TX.
–	$221	Provided funding for personnel management support from Program Executive Officer, Missile Defense, Huntsville, AL.
–	$45,536	Total

FY 1998 ($ in Thousands):

–	$1,027	Continue utilization of TOTS at US BMD test ranges.
–	$10,165	Provide scientific, engineering, and technical support for the acquisition, integration, and fielding of TMD systems including: review of products in comparison to standards, specifications, and requirements; modeling and simulation support of architecture analyses and trade-off studies; risk reduction and acquisition streamlining support; engineering and technical support for international programs and BM/C3 efforts; conduct Extended Air Defense Testbed (EADTB) distributed analyses and operations; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation.
–	$6,000	Using FFRDC resources, perform independent technical and engineering assessments of TMD system architectures including: system concept development and assessment; critical element technical and programmatic assessments including trade-off analyses; reviews of mandated documents, international cooperative programs, and treaty implications; multi-Service and allied BM/C3 integration; modeling, simulation, experiment and flight test support; integration of fielded components into operational units; and specific studies and analyses of critical issues.
–	$4,000	Provide technical support to the TMD JEA, individual system JEAs, and congressionally-directed studies.
–	$19,038	Increase system engineering and integration support at the TMD system level. Continue to identify inter-Service integration interfaces; prepare engineering documents to identify changes required in theater air defense C3I systems to support TBMD; update TMD Integrated Test Plan; update system description documents; and plan, coordinate, and analyze C2 wargames for CINC CONOPS development.
–	$4,120	Provide support to Service integration, interoperability, and resolution of interface issues; determine adequacy of threshold/objective specifications for C4I support equipment; continue modeling and simulation tool improvements; assist in coordinating technology infusion to support pre-planned product improvements; continue support to TMD program offices in refining software development practices and mitigating technical, cost, and schedule risks across BMD/TMD software development, integration, testing, and maintenance efforts.
–	$150	Provide support for USMC for special studies, SII support and also to develop interoperability and information architecture for TMD.
–	$5,840	Support for BMDO services (e.g., security, contracting, supplies).
–	$12,521	Theater Air and Missile Defense Integration
–	$62,861	Total

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FY 1999 ($ in Thousands):

- $1,013 Continue utilization of TOTS at US BMD test ranges.
- $3,389 Provide Scientific, Engineering and Technical Assistance (SETA) support of TMD systems acquisition.
- $6,000 Using FFRDC resources, perform independent and technical engineering assessment and studies to support fielding TMD systems.
- $3,528 Support BMDO operations and personnel management.
- $2,000 Provide technical support to congressional directed studies (e.g. JEA).
- $4,044 Technical Support for BMDO services.
- $19,974 Total

Acquisition Strategy: This project uses a combination of FFRDC, competitively awarded SETA contracts, and a Memorandum of Understanding (MOU) with the United Kingdom Ministry of Defense.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	50,909	65,260	62,031	223,558
Appropriated Value		65,260		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,960		
b. Internal Realignments		-439		
FY1999 President's Budget	45,536	62,861	19,974	172,465

Change Summary Explanation:

Funding: Funding reduced to fund higher priority projects in FY97-FY99. Service Systems Engineering efforts were transferred to PE 0603873C starting in FY99.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Engineering Milestone												
T&E Milestone												
Tech Demo Milestone												
Contract Milestone												
- Deliver TMD Sys RD				*				X				X
- Deliver TMD Sys Assessment Doc				*				X				X
- Deliver TMD Int Test Plan				*				X				X
- Deliver TMD C3I Int Assessment				*				X				X
- Deliver TMD Surv Assessment				*				X				X
- TMD BMC3 WG Plan/Exec			*	*			X	X			X	X
- TIBS/TRAP Msg Int				*				X				X
BMDO EADTB Node Development												
- Node IOC												
- Full distributed Operations		*				X				X		
Support through delivery of integration engineering analysis the following TMD events:												
- Navy Area TBMD Def COEA comp												
- Navy Area TBMD Defense MS II												
- THAAD Flight Test	*	*	*	*								
- Complete NATO Mag Set Tests	*											
- TMD-GBR Target Tests		*	*									
- PAC-3 CDR		*										
- BPI PDR		*										
- C3I Integration Test			*				X				X	
- System Integration Test				*				X				X
- THAAD MS II						X						
- PAC-3 LRIP Decision								X				
- BPI KKV CDR						X						

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
- MEADS SRR							X					
- Navy Theater-wide Informed Decision								X				
- Navy Theater-wide TBMD MS I										X		
- BPI Integration Tests										X		
- THAAD UCT										X		
- UOES Delivery											X	
- PAC-3 MS III												X
- MEADS MS II/III											X	

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	PROJECT 3251

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Developmental Test & Evaluation	891	1,027	1,013
Program Management Support	22,761	21,899	14,528
Systems Engineering	18,157	31,830	0.000
Program Management Personnel	3,727	8,105	4,433
Total	45,536	62,861	19,974

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
SETA	CPAF	Nov 96				8,467	10,165	3,389	Continued	22,021
SEI - TRW	CPFF	Aug 95				11,450	19,038	0.000	Continued	30,488
Sys Eng - USAF						1,558	1,300	0.000	Continued	2,858
Sys Eng - USA						702	1,300	0.000	Continued	2,002
Sys Eng - USN						3,259	1,000	0.000	Continued	4,259
Sys Eng - BMDO						725	220	0.000	Continued	945
Sys Eng - JNTF						463	300	0.000	Continued	763
FFRDC/POET						12,834	6,000	6,000	Continued	24,834
USAAD Ops Spt						2,007	0.000	0.000	Continued	2,007
BMDO Ops/Pers						1,499	4,106	4,433	Continued	10,038

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BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
PEO Pers Mgmt						221	0.000	0.000	Continued	221
COEA/JEA						0.000	12,521	2,000	Continued	14,521
P3I						0.000	2,150	0.000	Continued	2,150
Other Supt.						1,460	3,734	3,139	Continued	8,333
Test and Evaluation Organizations										
DT&E - U.K.						11	0.000	0.000	Continued	11
DT&E - Intl Prog						880	1,027	1,013	Continued	2,920

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									

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Subtotal Product Development	44,645	61,834	18,961	125,440
Subtotal Support and Management	891	1,027	1,013	2,931
Subtotal Test and Evaluation				
Total Project	45,536	62,861	19,974	128,371

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3261 TMD BM/C3I (BM/C3I Concepts)*	30,584	35,465	0	0	0	0	0	TBD	TBD

A. Mission Description and Budget Item Justification

The objective of this project is to provide the warfighter with Theater Air and Missile Defense (TAMD) Battle Management/Command, Control, Computers and Intelligence (BM/C4I) that is flexible, responsive, and interoperable. TAMD is based on a Family-of-Systems (FoS) concept where the Services' air and ballistic missile defense and command and control (C2) systems are integrated together using various existing and developing communications capabilities and systems. The resulting FoS provides the CINC with a TAMD systems 'plug and fight' capability to address a wide variety of air and missile threats that can be tailored for his theater of operations.

To achieve this objective of providing the warfighter with flexible, responsive, and interoperable BM/C4I for TAMD, the Ballistic Missile Defense Organization (BMDO) uses this project to provide oversight, leadership, guidance, and support to the Services' TAMD BM/C4I programs. The focus is on Joint approaches to integrate and synergize the Services' programs.

In recent years, this project has been focused on three thrusts: (1) early warning and dissemination of theater ballistic missile launch information, (2) communication interoperability, and (3) command and control upgrades. In concert with this successful approach, BMDO has developed a TAMD BM/C4I Architecture to enable further improvements in TAMD performance. By focusing project efforts on this architecture, the integration of individual activities will be enhanced while continuing to support earlier objectives.

This TAMD BM/C4I Architecture can be viewed as a set of FoS connectivities and common mission functions integrated via three networks. The first network to be implemented is the Joint Data Network (JDN): a near-real-time network based primarily on the Tactical Digital Information Link [TADIL-J / LINK-16] datalink to provide overall FoS situational awareness, command and control, and weapon coordination. The second network to be implemented is the Joint Planning Network (JPN): a non-real-time/near-real-time network building upon the Global Command and Control System (GCCS) to support centralized planning and guidance. The JPN will complement the JDN by enabling consistent TAMD plan development and dissemination across command levels, Services, and CINCs. The third and final network to be implemented is the Joint Composite Tracking Network (JCTN): a real-time network based on the Navy's Cooperative Engagement Capability (CEC) to directly link sensors and shooters within a theater to provide fire quality information to maximize the synergy of multiple systems.

To achieve the TAMD BM/C4I Architecture, project efforts will address the following key areas: the development of external cueing for FoS sensors; the implementation of JDN [TADIL-J / LINK-16] TMD messages in FoS C2 nodes; and the development and integration of GCCS TMD applications. The overall objective of this project is to ensure the integration of Service systems so that they will be both affordable and interoperable.

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	PROJECT 3261

FY 1997 ($ in Thousands):

–	$6,021	BM/C3I Integration - Army: Integrated JTIDS into Army systems; developed terminal initialization parameters; demonstrate enclave interoperability; integrated User Operational Evaluation System (UOES) upper/lower tier; continued TMD Cell/TOC automation.
–	$14,315	BM/C3I Integration - Air Force: Continued TADIL-J TMD message set integration efforts into JTIDS host C2 platforms, completed GTACS and initiated AOC and ABCCC upgrades for TMD; completed TADIL-J Range Extension (JRE) performance analysis and ROM implementation cost estimates; demonstrated proof-of-concept tool for automatic application of digitized TMD Intelligence information; began JDP and TCTA software integration in TBMCS v1.0; continued JTIDS correlation (for closely spaced objects) and Time Slot Reallocation (TSR) benefit analyses.
–	$5,400	BM/C3I Integration - USMC: Completed development of AN/TPS-59 cue acceptance software; commenced development of TAOM BM/C3I TMD software.
–	$577	BM/C3I Integration - Navy: Supported joint development of JTIDS Range Extension (JRE).
–	$1,900	BM/C3I Integration - Joint/Combined: Obtained/approved additional TADIL-J TMD messages; transitioned MIDS development to the Army; conducted evaluations of JTIDS networks to determine value of JTIDS Time Slot Reallocation (TSR); began software integration of TMD messages; obtained NATO approval of additional TADIL-J messages; performed an integrated engineering analysis for the joint composite tracking network (JCTN) including the cooperative engagement capability.
–	$2,371	BM/C3I Integration - Joint National Test Facility (JNTF): Conducted TMD BMC3I work shop; conducted C2 tests to refine C2 procedures; deployed joint TMD planning capability to command centers for initial user testing.
–	$30,584	Total

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 3261

FY 1998 ($ in Thousands):

–	$7,630	BM/C3I Integration - Army: Field two Tactical Operations Centers (TOC) to active Army brigades; support JTIDS Range Extension (JRE) efforts; participate in JTIDS network management activities; initiate Joint Defensive Planner (JDP) (formerly known as Joint TMD Planner) integration into Army host platforms.
–	$11,835	BM/C3I Integration - Air Force: Continue TADIL-J TMD message set integration, complete AOC and ABCCC, initiate remaining JSTARS upgrade for TMD; Continue to support JRE IPT process and joint protocol standardization; Complete JDP 1.0 and TCTA software integration in TBMCS v1.0; Complete development of functional and software architecture for Automated Application of Intelligence Preparation of the Battlespace (A2IPB) and start A2IPB prototype development; Begin Integrated Surveillance system (ISS) architecture development and analysis of situation awareness correlation/fusion techniques; Implement R2 correlation algorithm for live exercise testing; Develop Communications Planning Module (CPM) prototyping and demonstration plan.
–	$2,160	BM/C3I Integration - Navy: Continue support of joint development of JRE and integrate JDP into JMCIS for initial assessment/evaluation.
–	$3,598	BM/C3I Integration - USMC: Complete testing of AN/TPS-59 cue capability; and continue TAOM BMC3I software development.
–	$7,608	BM/C3I Integration - Joint/Combined: Update TADIL-J message set approval, support JRE development and NATO TMD BMC3 analyses, and initiate definition and development of joint composite tracking network (JCTN).
–	$2,634	BM/C3I Integration - JNTF: Continue BM/C3I work shops; support JDP requirements update based on initial test/demo results; and provide Global Command and Control System (GCCS) capability for TMD applications evaluations.
–	$35,465	Total

FY 1999 ($ in Thousands):

–	$0	This project has been transferred to PE 0603873C starting in FY99.
–	$0	Total

Acquisition Strategy: The 3261 Project acquisition strategy leverages existing system acquisition programs (which are subject to milestone decisions and testing) and accomplishes supporting tasks to satisfy BM/C3I performance requirements. A significant portion of this project entails systems engineering of separately funded and managed service programs so that all systems will interoperate when fielded.

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603872C Joint Theater Missile Defense	3261

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	32,357	34,094	35,864	102,315
Appropriated Value		34,094		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,280		
b. Internal Realignments		+2,651		
FY1999 President's Budget	30,584	35,465	0	66,299

Change Summary Explanation:

Funding: FY96 funds were reallocated to this project within the PE to support Joint Composite Tracking Network engineering analysis. In FY97-98, this project was reduced to support higher priority projects. As a result, advanced battle management analysis and prototyping will be delayed by at least one year. Also, prototyping and development support for a Joint Technical Architecture-compliant USMC command and control system will be delayed by at least one year. Funding for this project has been transferred to PE 0603873C starting in FY99.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

While this program is not dependent upon funding from other programs, it supports other programs by providing capstone systems engineering, common BM/C3I guidance, interface support, joint network design analysis, and other actions necessary to achieve interoperability among independent systems. In addition to the funds described in this exhibit, funding for Project 3261 has been assigned to the Program Elements as shown below:

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3261 TMD BM/C3I PE: 0603873C	0	0	32,082	37,870	43,597	42,281	42,215	Cont.	Cont.

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D. Schedule Profile

Engineering Milestone	FY 1997 1	2	3	4	FY 1998 1	2	3	4	FY 1999 1	2	3	4
Data link handbook published (Army)												
TMD software library & re-use database established (Army)												
Two CIC/SAAWF prototypes demonstrated (USAF/USMC)												
AWACS TMD message implementation software delivered(AF)				*								
Brigade TOC fielding (Army)				*				X				
Initiate AF platform TMD message set implementations for AOC, ABCCC, and AWACS (AF)					X							
JDP v1.0 to JNTF for VV&A (AF)					X							
JDP v1.0 integration into JMCIS (AF/Navy)								X				
Recommended approach for TMD area limitation (AF)								X				
AN/TPS-59 cue capability (USMC)								X				
Fielding of USMC TAOM TMD upgrades												
A2IPB integration into TBMCS v2.0 (AF)												

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Hardware Development	5,601	13,388	0
b. Software Development	18,011	11,235	0
c. System Engineering	6,972	10,842	0
Total	30,584	35,465	

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Army PEO-AMD	Allotment	Multiple			0	6,021	7,630	0	Complete	13,651
Air Force ESC	Allotment	Multiple			0	14,315	11,235	0	Complete	25,550
USMC Sys Com	Allotment	Multiple			0	5,400	4,198	0	Complete	9,598
Navy PEO(TAD)	Allotment	Multiple			0	577	2,160	0	Complete	2,737
BMDO	MIPRs/Allot	Multiple			0	1,900	7,608	0	Complete	9,508
JNTF	Allotment	Multiple			0	2,375	2,634	0	Complete	5,009
Support and Management Organizations										
Test and Evaluation Organizations										

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Subtotal Product Development	30,588	35,465	66,053
Subtotal Support and Management			
Subtotal Test and Evaluation			
Total Project	30,588	35,465	66,053

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3265 User Interface	15,762	16,280	18,046	20,462	21,519	21,375	21,366	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project provides the Joint Staff and the warfighting Commanders-in-Chief (CINCs) with the means to ensure that the Theater Missile Defense (TMD) development reflects evolving military needs and the combined warfare capabilities of allies and friends. To accomplish this, there must be clearly articulated tactics, doctrine, policies, and procedures. The three areas which provide the information base to effectively transition TMD capabilities into the existing and planned operational activities and war plans are described below.

The project's primary area is focused on the refinement of existing and near-term TMD capabilities. This is accomplished through the CINC's TMD Assessments Program, which involves the addition of TMD activities to numerous operationally realistic military exercises. These exercises provide the basis for the assessment, development, and improvement of TMD capabilities. Specific activities include the integration of new technology and hardware into the CINC operations, and the integration of User Operational Evaluation Systems (UOES) to examine the effectiveness of architectures and operational concepts. UOES is a prototype operational system of hardware and procedures which will be user-operated for field evaluation purposes. Through the Assessments Program, the CINCs develop Battle Management Command, Control, and Communications (BM/C3) architectures, formulate and test operational concepts, and determine or refine operational requirements. This program exercises communications architectures and develops operational concepts that will enable rapid integration of the PATRIOT Advanced Capability (PAC-3), Theater High Altitude Area Defense (THAAD), and Navy Area Theater Ballistic Missile Defense (TBMD) into the theater's warfighting capability. In future years, the CINCs' TMD Assessment Program will continue to develop ways to improve the CINCs' warfighting capabilities and integrate emerging TMD capabilities through simulation and employment of UOES hardware. Within the context of Combined Warfare, the Assessments Program focuses on providing the means for the U.S. and its allies to develop an understanding of each other's doctrine and common concepts of operation, and to determine equipment compatibility and interoperability.

The second area focuses on understanding the changing threat and how to best counter that threat. This is accomplished through the conduct of Warfare Analysis Laboratory Exercises (WALEX). Relying primarily on computer simulation tools and real experiences from the CINC's Assessment program, these exercises are performed to educate the warfighter concerning the challenges presented by the theater missile threat. The WALEX provide forums for discussion of complex issues associated with concepts of operation for existing and future capabilities.

The third area focuses on the integration of warfighter operational requirements with near and far term Ballistic Missile Defense (BMD) program development. TMD programs (e.g. THAAD, Navy TBMD, etc.) are in various stages of development, and are scheduled for future deployment. This project area ensures that the experiences gleaned from such programs as the CINC's Assessment program are factored into all TMD programs. These programs are to develop and acquire TMD

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systems and architectures to (a) deploy theater missile defense capability to protect forward-deployed armed forces of the U.S., friends, and allies; and, (b) demonstrate advanced technologies for near-term insertion options and concept development of new systems. Analyses and simulations address systems effectiveness of proposed TMD system architectures against ballistic missile threats to U.S. deployed forces, our allies and friends. Analytical results are also used to support activities required for the Defense acquisition process. Theater gaming with the CINCs is also supported to identify roles, missions, and requirements for TMD.

FY 1997 ($ in Thousands):

- $3,320 Supported USEUCOM Joint Project Optic Needle.
- $3,520 Supported USCENTCOM Joint Project Optic Cobra.
- $3,570 Supported USFK Joint Project Ornate Impact.
- $2,760 Supported USACOM TMD Exercises.
- $933 Supported USPACOM TMD Exercises.
- $364 Reviewed ORDs.
- $139 Conducted theater and strategic wargaming, including GLOBAL 97.
- $250 Conducted mission analysis for TMD (including allies/friends).
- $339 Conducted five Warfare Analysis Laboratory Exercises.
- $567 Exercised Data Collection
- $15,762 Total

FY 1998 ($ in Thousands):

- $3,000 Support USEUCOM Joint Project Optic Needle.
- $3,000 Support USCENTCOM Joint Project Optic Cobra.
- $3,000 Support USFK Joint Project Ornate Impact.
- $2,750 Support USACOM TMD Exercises.
- $2,500 Support USPACOM TMD Exercises.
- $576 Integrate capability to display simulated TBMs on developing operator radar scopes supporting Field Training Exercises.
- $100 Review ORDs/CRD
- $94 Conduct theater and strategic wargaming, including GLOBAL 98.
- $485 Conduct mission analysis for TMD (including allies/friends)
- $775 Conduct Warfare Analysis Laboratory Exercises.
- $16,280 Total

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FY 1999 ($ in Thousands):

- $3,430 Support USEUCOM Joint Project Optic Needle.
- $3,430 Support USCENTCOM Joint Project Optic Cobra.
- $3,430 Support USFK Joint Project Ornate Impact.
- $3,180 Support USACOM TMD Exercises.
- $2,929 Support USPACOM TMD Exercises.
- $292 Integrate capability to display simulated TBMs on developing operator radar scopes supporting Field Training Exercises.
- $100 Review ORDs/CRD
- $82 Conduct theater and strategic wargaming, including GLOBAL 99.
- $440 Conduct mission analysis for TMD (including allies/friends).
- $733 Conduct Warfare Analysis Laboratory Exercises.
- $18,046 Total

Acquisition Strategy: Management is executed through the use of weekly task plans, monthly progress and expenditure reports, quarterly reviews, and semi-annual assessments. Each theater conducts monthly In-Process Reviews to monitor and manage the preparation for scheduled activities. ORDs/CRD and CONOPs are updated throughout the year.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	14,031	14,680	21,976	65,973
Appropriated Value		14,680		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-614		
b. Internal Realignments		+2,214		
FY1999 President's Budget	15,762	16,280	18,046	65,367

Change Summary Explanation:

Funding: Additional funds received in FY97 for Roving Sands support. Funding reduced in FY99 to support higher priority projects.

Schedule: None

Technical: None

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C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl Cont.	Total Cost Cont.

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Joint Projects	*	*	*	*	X	X	X	X	X	X	X	X
Model and Wargame	*	*	*	*	X	X	X	X	X	X	X	X
Refine ORD/CONOPS	*	*	*	*	X	X	X	X	X	X	X	X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
CINC Exercise Assessment Support	14,895	14,826	16,436
Allied interface, wargaming, WALEX, Rqmts Document Spt	867	1,454	1,610
Total	15,762	16,280	18,046

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
CINCs	MIPRs	Multiple				15,762	16,280	18,046	Continued	Continued
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development Subtotal Support and Management Subtotal Test and Evaluation					15,762	16,280	18,046	Continued	Continued
Total Project					15,762	16,280	18,046	Continued	Continued

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3270 Threat and Countermeasures Program**	21,012	21,496	0	0	0	0	0	TBD	TBD

A. **Mission Description and Budget Item Justification**

Threat and Countermeasures Program. The BMDO Theater Missile Defense (TMD) Threat Program defines potential adversary military forces, principally Theater Ballistic Missile (TBM) threats. To accomplish this mission, BMDO has a threat development program which is based on intelligence community projections and is traceable to quantifiable analysis. This project produces Capstone threat and countermeasure documentation to ensure consistent technical threat definitions across all the Services. It does not duplicate Service-unique activities. The program consists of three component tasks: Intelligence Threat, System Threat Scenario Generation, and Countermeasures Integration.

Intelligence Threat Task. The purpose of this task is to provide an Intelligence Community-Validated TMD threat description. The threat is divided into four major categories under this task: Operational Threat Environment, Targets, System Specific Threats (SST), and Reactive Threats. The Operational Threat Environment includes assessments of the TBM operational and technological environments and projects the effects of developments and trends on TMD mission capability. The Targets category includes a projection of foreign TBM systems and countermeasures that enhance their performance. This includes force structure, performance characteristics, and sample signatures. SST addresses threats to the TMD "family of systems" including reconnaissance, surveillance, and target acquisition; lethal and non-lethal threats; and regional integrated SST assessments. The Reactive Threats category includes those that an adversary may develop as a result of deployment of the TMD "family of systems."

System Threat Scenario Generation Task. The accurate specification and characterization of ballistic missiles and the appropriate development and integration of scenarios using these characterizations are critical to the analysis of alternative ballistic missile architectures, the performance assessments of potential technology applications, and the operational performance evaluations of candidate designs. This task provides baseline and excursion scenario descriptions in documentary and digital form for use in BMDO TMD cost and operational effectiveness analyses (COEA). These descriptions are the only approved threat employment portrayals authorized for acceptable BMDO analysis. This task:

Identifies user needs for threat scenario descriptions.
Identifies analyses needed to fully specify and characterize the threat missile systems, penetration aids, tactics, etc., and ensures the analyses are accomplished.
Provides the analysis results to all interested agencies for review and comment.
Addresses critical threat issues which arise during the analysis process.
Ensures all supporting agencies' views on threat issues are fully aired.

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Reviews, approves, produces, and distributes all System Threat Scenario Descriptions.
Produces threat computer digital media and supporting documentation for use by the development and acquisition communities.

Countermeasures Integration Task. The BMDO Countermeasure Integration (CMI) Program assists TMD acquisition program offices in developing theater ballistic missile defense systems that are robust to potential countermeasures and are practical and within the means of anticipated adversaries. Included in this mission are CMI Program support to the TMD threat development process and advance warning to BMDO system designers. The BMDO CMI Program reviews TMD systems for susceptibilities and identifies potential countermeasures, determines credibility through analyses and tests, characterizes credible countermeasures by providing designs and performance parameters, informs intelligence and system threat developers of potential countermeasures, informs TMD system designers with advance warning of potential countermeasures, and assists TMD system designers in developing counter-countermeasures. Providing vulnerability and susceptibility information to the system designers early enables them to build robustness into their designs during the early stages of the system development process, a cost-effective means for providing a flexible high-performance design. The CMI Program takes a "rest-of-world" perspective in developing credible, potential countermeasures.

FY 1997 ($ in Thousands):

- $5,327 Intelligence Threat Task: Provided Capstone STAR, specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- $4,707 System Threat Scenario Generation Task: Continued development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgrade the threat modeling capability and produce digital media and supporting documentation through the JNTF. Develop scenarios depicting threat systems employed in theater environments.
- $10,978 Countermeasures (CM) Integration Task: Performed TMD CM Red/Blue activities and counter-countermeasure parametric studies and TMD CM technical experiments and evaluations. Supported CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conducted non-technical analysis, oversight, and database management.
- $21,012 Total

FY 1998 ($ in Thousands):

- $6,944 Intelligence Threat Task: Provide Capstone STAR, specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- $5,389 System Threat Scenario Generation Task: Continue development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgrade the threat modeling capability and produce digital media and supporting documentation through the JNTF. Develop scenarios depicting threat systems employed in theater environments.
- $9,163 Countermeasures (CM) Integration Task: Perform TMD CM Red/Blue activities and counter-countermeasure parametric studies and TMD CM technical experiments and evaluations. Support CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conduct non-technical analysis, oversight, and database management.
- $21,496 Total

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FY 1999 ($ in Thousands):

- $0 See PE 0603875C
- $0
- $0
- $0 Total

Acquisition Strategy: Funding is provided to executing agents who accomplish tasks under existing contracts via Military Interdepartmental Purchase Requests (MIPR); Scientific, Engineering, and Technical Assistance (SETA) contracts; and Federally Funded Research and Development Centers (FFRDCs) contracts.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	21,419	27,986	29,154	98,424
Appropriated Value		27,986		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-845		
b. Internal Realignments		-5,645		
FY1999 President's Budget	21,012	21,496	0	62,373

Change Summary Explanation:

Funding: Funding reduced in FY97 and FY98 to support higher priority projects. Project funds were transferred to PE 0603875C starting in FY99.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3270 NMD Program, PE 0603871C	6,935	688	0	0	0	0	0	Cont	Cont

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Skunkworks Mission #2	*	*	*	*	X	X	X	X				
Skunkworks Mission #3			*				X					
Skunkworks Mission #5			*	*			X					
Skunkworks Mission #6												
Skunkworks Mission #7												
Skunkworks Mission #8												
Skunkworks Mission #9			*			X						
Skunkworks Mission #10								X				
TMD Capstone STAR			*					X				
Countermeasures Risk Assessment Process												
Semi-Annual Update (Starting 3Q/FY96)												

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Intelligence Threat	5,327	6,944	0
b. System Threat Scenario Generation	4,707	5,389	0
c. Countermeasures Integration	10,978	9,163	0
Total	21,012	21,496	

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
DOE Sandia Lab					0	1,984	1,575	0		3,559
JNTF-SPC					0	1,250	2,000	0		3,250
MIT Lincoln Lab					0	2,133	2,850	0		4,983
CM Tech Eval										
Physitron					0	0	0	0		430
USASSDC					0	0	0	0		
Sandia TDP					0	0	0	0		1,500
Test and Evaluation Organizations										
Dynetics					0	0	0	0		2,340
SPC CM					0	2,213	3,300	0		5,513

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Booz-Allen					0	1,963	0	0		4,186
SPC-Threat					0	2,000	2,000	0		5,936
Nichols-Threat					0	2,351	2,960	0		7,325
CHOP/Phillips					0	3,642	1,798	0		5,440
MSIC					0	125	131	0		256
NAIC					0	125	131	0		256
TRW					0	1,944	1,148	0		6,812
Loral					0	532	353	0		2,015
Dept of Commerce					0	750	0	0		1,500
TBE					0	0	0	0		3,720
NGIC					0	0	1,250	0		1,250
IDA					0	0	2,000	0		2,000
Miscellaneous					0	0	0	0		102

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management					5,367	6,425			13,722
Subtotal Test and Evaluation					15,645	15,071			48,651
Total Project					21,012	21,496			62,373

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3352 Modeling and Simulations**	66,409	53,153	11,605	12,013	11,922	11,847	11,836	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project ensures timely availability of reliable, cooperative, and cost-effective BMDO and Service-provided Modeling, Simulation, & Networks (MS&N) tools and capabilities responsive to BMDO requirements. This project provides for the planning, coordination, program management, and technical oversight of system level M&S for the Theater Air Missile Defense (TAMD) and the National Missile Defense (NMD) Deployment Readiness Programs. This cost effective approach reduces the high cost of missile test programs and generates the information needed to make timely and informed operational, requirements, performance, design/cost/risk tradeoffs, mitigation and resource allocation decisions.

MS&N programs funded by this project include: Wargame 2000, Extended Air Defense Test Bed (EADTB), Extended Air Defense Simulation (EADSIM), M&S Roadmap, Mission Oriented Information Technology Resources (ITR), BMDO Data Centers, Ballistic Missile Defense (BMD) Virtual Data Center (VDC), the BMD Simulation Support Center (SSC), and the infrastructure portion of the Advanced Research Center/Simulation Center (ARC/SC) and the Joint Missile Defense Network (JMDN) that supports the capability to interoperate in a distributed interactive simulation (DIS) environment.

This project funds the development, operation, and Verification, Validation and Accreditation (VV&A) of the EADTB and the EADSIM which support the analysis required for TAMD program acquisition and integration. The EADTB is a flexible distributed simulation tool that can determine the performance of existing and conceptual extended air and missile defense systems with the added complexity of theater missile defense threats. This is a multi-node test bed that is comprised of high and medium fidelity models of sensors, environments, weapon systems, threats, and Battle Management Command, Control and Communication (BM/C3) systems. The capabilities of the EADTB are being incrementally developed and accredited with the Services. EADSIM is a low to medium detail simulation system that operates on a stand-alone workstation. This simulation is used for architectural analysis of EAD systems and provides user interface for scenario preparation and model description.

Additionally, this project funds the design and development of Wargame 2000, a simulation to run wargames and exercises at the Joint National Test Facility (JNTF) for the next 10 years. Wargame 2000 will replace the obsolete Advanced Real-time Gaming Universal Simulation (ARGUS) now used for such support at the JNTF. The requirements are to: design the simulation using object oriented paradigm, enable "plug and play" of TAMD and NMD models, facilitate integrating BMDO's JNTF internal and external elements into a flexible real-time simulation suite, incorporate more realistic C2 displays, enhance wargaming productivity and responsiveness, and provide for multiple levels of security. Additionally, VV&A of the Wargame 2000 will be performed in support of the NMD 98-B game.

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This project also funds the BMDO Data Center Program. The purpose of the BMDO Data Centers Program is to archive, manage, develop, data products, and distribute and provide remote access to data from large volumes of science and technical data/information generated from experiments, tests, demonstrations, wargaming, simulations, model executions, Analyses of Alternatives (AOAs), and evaluations. Operation and management of the Data Center activities are accomplished at four sites: Advanced Missile Signature Center (AMSC), Arnold Engineering and Development Center, Arnold Air Force Base, Tullahoma, TN; Backgrounds Center of Expertise (BCOE), Naval Research Laboratory, Washington, DC; Missile Defense Data Center (MDDC), Space and Missile Defense Command, Huntsville, AL; and the BMD SSC, JNTF, Falcon AFB, CO. Each joint data center specializes in a particular discipline related to data management of target discrimination and detection data and is co-located with an existing DoD center of expertise.

In addition to the BMD Data Center functions, the BMD SSC will be BMDO's centralized repository for joint, global and multi-level fidelity M&S tools to seamlessly link with existing and planned simulations or C4I networks, platforms and weapon systems, with little or no apparent differences between simulation and reality. This activity will also include the development of a centralized M&S catalogue of data bases to identify current and under-development BMDO simulation tools, and retain the BMDO assessment capability with support from the Services.

This project also provides acquisition and support services for the design, development, modernization and control of BMDO Mission Oriented ITR. The objective for this program is to provide responsive ITR support and services via a flexible, responsive architecture to satisfy validated current and projected user ITR requirements. Projects to be supported via these tasks include the VDC project, the Wargame 2000 initiative, the creation of a comprehensive ITR data base of requirements, and the development of a mission oriented ITR System Architecture that will be responsive to and satisfy these requirements.

M&S activities also funded by this project include: development, enhancement, and maintenance of the theater test beds and conduct of wargames that provide the analysis, integration, demonstration, and performance verification for TAMD systems. It ensures joint usage of simulation tool resources, supports allied and friendly international participation and cooperation in wargaming exercises. This project focuses M&S support in four primary areas: assessments, development/modification, computer architectures/networks, and program management for BMDO and Service M&S programs.

The ARC/SC's BMD M&S infrastructure support is also funded via this project. This effort supports integrated simulation for BMD system development and evaluations, and supercomputing resources to operate a multiple test bed environment for conducting research and development activities for Army and Ground Based Elements including EADTB, EADSIM, TAMD System Exerciser (SE) and the TAMD Theater High Altitude Area Defense (THAAD) System Radar Test Bed.

Funding for these facilities is distributed through Project 3352. Four Program Elements (PEs) (NMD, TAMD, Support Technology, and BMD Technical Support) provided funding. This cost sharing approach ensures cooperation, contributes to achieving synergy across the efforts, and minimizes duplication of modeling and simulation resources. This document describes the TAMD portion of funding for these activities.

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FY 1997 ($ in Thousands):

–	$16,969	Delivered EADTB Capability 4.1 and 4.2 (upgrades include threat tape enhancements, EADTB site support - including JNTF, Ft. Bliss, NSWC, TACCSF, and NC3A). Continued development of EADTB Service certified SSRs. Limited EADSIM and EADTB site support. Continued EADTB VV&A activities. Provided EADSIM baseline maintenance. This figure also includes civilian salaries.
–	$26,065	Provided infrastructure and core capability funding for the JNTF. This includes: operations and maintenance of the facilities, personnel, computer hardware and software, communications, networks, systems engineering, security, and other capabilities essential to common system support to the BMDO; super-computing and wargaming resources for TAMD Wargame and Workshop efforts; studies and analysis expertise and resources to the BMD community to address BMD issues across the entire development and operational spectrum; and development and operation of the Joint TAMD Planning Tool; development of the BMD SSC; contribution to the JNTF Modernization/Rolling Technology Update; and continued support to the Information System Security Engineering/Multi-Level Security program. Continue support as the central hub of the JMDN linking Services, contractors, and other DoD/government facilities. This figure also includes JNTF civilian salaries.
–	$2,800	Provided JNTF Project funding to support: development of a detailed schedule and cost profile and development of a software requirements document for entire Wargame 2000 program
–	$829	Provided JNTF Project funding to support; one TAMD Wargame; one TAMD Workshop; Human in Control Test Bed modifications; the development of the BMD SSC; and the development of ALERT, SBIRS and JDN Common Rule Sets SSRs for the EADTB program.
–	$11,705	Provided super-computing resources and infrastructure funding at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements including the EADTB, EADSIM, and the THAAD Test Bed. Major areas of support include maintenance, modification, and enhancements of/to: CFD analysis; AOA of TAMD systems; technical base analysis; concept studies; and alternative trade-off analysis.
–	$2,504	Provided BMDO M&S support in four primary areas: assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Top priorities include: supporting the development of Wargame 2000, the BMD SSC, and the M&S Roadmap.
–	$4,339	Provided Service M&S support to BMDO. This project focus's on the development of Service certified SSRs for the EADTB program. The following SSRs are being developed: Army - THAAD, JTAGS, Corps SAM, ADTOC, PAC-2 and PAC-3; Air Force - AWACS, and Generic Fighter; and Navy - TBMD Aegis.
–	$1,198	Modernized JNTF's computer capabilities based on supporting BMD program priorities.
–	$66,409	Total

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FY 1998 ($ in Thousands):

– $16,750	Define, develop, test, integrate, and deliver EADTB Capability 4.3. Begin integration of runtime infrastructure to support High Level Architecture (HLA) compliance/HLS study. Compile V&V documentation to support user accreditation decisions. Provide selective co-funding of EADTB application. Obtain EADTB study documentation. Define, direct and integrate the SSR Certification Program with JDN. Participate in TAMD Joint Engagement Operations Study. This figure also includes civilian salaries.
– $16,448	Provide super-computing resources and infrastructure funding at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements including the EADTB, EADSIM, the THAAD Test Bed, TISES, and TAMD SE. Major areas of support include maintenance, modification, and enhancements of/to: CFD analysis; AOA of TAMD systems; technical base analysis; concept studies; and alternative trade-off analysis. This figure also includes civilian salaries.
– $2,924	Provide BMDO M&S support in four primary areas: assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Provide continued support to continue development and refinement of the M&S Roadmap.
– $2,381	Provide continued funding for BMDO Service M&S activities. Top priorities include continued development of the EADTB SSRs. Specific Service SSR support includes continued/completed development of: Army - PAC 2/3, THAAD, MEADS, JTAGS, ADTOC; Air Force - AWACS, Generic Fighter, CEC; and Navy - TBMD Aegis, JNTF - ALERT, SBIRS and JDN Interoperability.
– $2,806	Continue to fund modernization and upgrades of Mission Oriented ITR in BMDO and BMDO-funded missile defense development programs in order to satisfy validated requirements of the ITR user community.
– $7,510	Provide JNTF Project funding to support continued development of Wargame 2000. The Wargame 2000 program will continue to design and develop a "world-class" simulation tool for use in support of CinC wargames and exercises testing operational concepts involving TAMD. Major emphasis will be given to verification, validation and accreditation (VV&A) of Wargame 2000 software and simulation operations.
– $705	Provide JNTF Project funding to support continued development of the BMD SSC. The BMD SSC will continue support to TAMD and NMD in the following areas: assist in software development process improvement for M&S, develop processes for testing and improving models and algorithms, incorporate new WEB technologies into the BMD SSC, and update the TAMD, and NMD M&S catalogs/repositories. The BMD SSC will also connect to the DMSO Modeling and Simulation Resource Repository (MSRR).
– $3,629	Provide the BMDO Data Centers Program funding to archive, manage, develop data products, distribute and provide remote access to all relevant BMD test, experiment, M&S, and wargame data. Data activities support target discrimination and detection. Specific priorities include: AMSC - provide TAMD FoS, NTW, Navy Area TBMD and other TAMD program data management support; BCOE - provide Navy Theater Wide (NTW) and Navy Area TBMD programs data management support; MDDC - provide TAMD FoS, THAAD, PAC-3/PATRIOT, MEADS, ARROW, and other TAMD programs data management support; BMD SSC - provide Optic Cobra, TAMD SE, SIT-98, SIT-00, CINC Assessments, Wargame 2000, and the EADTB data management support.
– $53,153	Total

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FY 1999 ($ in Thousands):

- $11,605 Deliver EADTB development and enhancements. Perform EADTB Final Formal Qualification Testing and begin development of EADTB Version 5.0. Provide limited site support to all EADTB users. Provide EADSIM baseline maintenance. Continue limited EADTB VV&A activities.
- $11,605 Total

Acquisition Strategy: The tasks in this project are met through full and open competition. Primary M&S support is performed at the JNTF, ARC/SC, MDDC, AMSC, BDC, BMD SSC and other test bed facilities. The JNTF support contracts were awarded to Loral (Operations & Maintenance) and TRW (Research & Development) in FY95; both contracts are Cost Plus Award Fee. The ARC/SC contractor is a Cost Plus Fixed Fee (CPFF) with COLSA and Madison Research Corp, first awarded in June of 1989. The prime contractor for development and operation of the EADTB is Hughes Aircraft, which was awarded a Cost Plus Award Fee (CPAF) contract in September 1989.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	64,180	73,173	72,984	281,699
Appropriated Value		87,973		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc.,)		-2,051		
b. Internal Realignments		-32,769		
FY1999 President's Budget	66,409	53,153	11,605	202,529

Change Summary Explanation:

Funding: Starting in FY97 the Mission Oriented ITR was transferred from project 4162 to project 3352; starting in FY98 the Operation and Maintenance of the JNTF was transferred to a new project (3353), and the BMD Data Center projects were transferred from project 1155 to project 3352. Starting in FY99 all tasks in Project 3352, with the exception of the EADTB (a TMD unique facility) are transferred to PE 0603874C.

Schedule: Due to the changes noted in the "Funding" section, the description summary and schedules reflect additional areas of responsibility.

Technical: None

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C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program, PE 0603171C	34,803	6,685	0	0	0	0	0	TBD	TBD
3352 Support Technologies - ATD, PE 0603173C	2,502	5,060	0	0	0	0	0	TBD	TBD
3352 BMD Technical Support, PE 0603174C	0	0	45,759	33,836	33,395	33,590	30,557	Cont'd	Cont'd

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Delivery of EADTB Version 3												
GBR/THAAD Integration Testing												
NMD/TMD Wargame 96-A/B												
Delivery of EADSIM Ver 6.0												
Delivery of German EADTB Software	*											
Delivery of EADTB Version 4.1		*										
Conduct TMD GBR Software Testing	*											
EADTB SSR Development PDR	*											
Conduct ARGUS Assessment	*											
Conduct ARGUS/Wargame 2000 PDR	*											
JTMDP Interim Release - Ver 0.5	*											
Initial JTMDP Software Rqmts Review	*											
TPT Requirement Scrubber (Assessment)		*										
EA TAD BMC4I Wargame			*									
Begin Wargame 2000 design/development			*									
Complete EADTB CMD SSR Dvmt			*									
EADTB SSR Development CDR			*									
SI&I Tool Assessment			*									
Conduct ARGUS/Wargame 2000 CDR			*									
Deliver TO Roadmap Version 1.0				*								
Delivery of EADTB Version 4.2				*								
Conduct Wargame 2000 PDR					*							

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Host EA TAD C4I Workshop					X							
Complete V&V of EADTB CMD SSR						X						
Update ST Management Plan					X							
Form BMDO Wargame Federation for the Wargame 2000 CDR						X						
Complete V&V of EADTB TBMD SSR						X						
Conduct Wargame 2000 Integration Testing/Demo						X						
Complete EADTB SSR Dvmt Phase I						X						
Deliver EADSIM Version 7.0								X				
BMD SSC Version 2.0						X						
TAMD GBR S/W Testing						X						
Update TOM Program Plan					X							
Conduct TAMD FoS Program Data Management Support					X							
Conduct Optic Cobra, TAMD SE, SIT-99, BMD SSC Connection to DMSO MSRR					X							
Complete EADSIM Software Enhancements to Support CINC Experiments						X						
Wargame 2000 Analysis Report						X						
VDC (Beta) Software & Hardware Acquisition						X						
Delivery of EADTB Version 4.3							X					
Complete TAMD Sim input to M&S Support Plan							X					
Conduct VDC (Beta) Design & Development						X	X	X				
Conduct VDC (Beta) T&E							X	X				
Establish and Execute VDC IOC Implementation								X				
Update M&S Roadmap								X				

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Conduct Wargame 2000 Integration								X				
Testing with ARGUS												
Deliver EADTB Capability 5.0											X	
EADTB Final Formal Qualification Testing											X	
BMDSSC Version 3.0								X				
Populate BMDSSC TAMD M&S								X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Extended Air Defense Test Bed Development	15,406	15,025	11,605
b. Army Civilian Salaries	2,404	2,654	0
c. Navy Civilian Salaries	256	0	0
d. JNTF Civilian Salaries	3,081	0	0
e. Service (Army, Navy, Air Force) M&S Support	4,339	2,381	0
f. JNTF M&S Support	3,629	8,215	0
g. BMDO M&S Support	2,504	2,924	0
h. BMDO Computer Modernization	0	2,806	0
i. JNTF Computer Modernization	1,198	0	0
j. Advanced Research Center	8,148	11,527	0
k. Simulation Center	2,716	3,992	0
l. JNTF O&M (Lockheed Martin)	11,176	0	0
m. JNTF R&D (TRW)	8,452	0	0
n. JNTF Contractor Support	3,100	0	0
o. BMD Data Centers	0	3,629	0
Total	66,409	53,153	11,605

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B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Colsa Corp -ARC	SS/CPFF					8,148	11,527	0	TBD	24,240
Madison Research Corp - Sim Center	Comp/CPFF					2,716	3,992	0	TBD	8,230
Hughes Aircraft - EADTB Dvmt	CPAF	Sep-89				15,406	15,025	11,605	TBD	62,999
Lockheed Martin - JNTF						11,176	0	0	TBD	26,183
TRW - JNTF						8,452	0	0	TBD	15,930
BMDO M&S						2,504	2,924	0	TBD	6,043
JNTF M&S						3,629	8,215			11,844
Service M&S						4,339	2,381	0	TBD	14,531
BMDO Computer Mods						0	2,806	0	TBD	2,806
JNTF Computer Mods						1,198	0	0	TBD	1,198
BDM Data Centrs						0	3,629	0	TBD	3,629
Support and Management Organizations										
Army Civilian						2,404	2,654	0	TBD	8,961
JNTF Civilian						3,081	0	0	TBD	6,022
Navy Civilian						256	0	0	TBD	978
JNTF - NAAS						3,100	0	0	TBD	8,935

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Test and Evaluation Organizations										

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					57,568	50,499	11,605		177,633
Subtotal Support and Management					8,841	2,654			24,896
Subtotal Test and Evaluation									
Total Project					66,409	53,153	11,605		202,529

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3353 JNTF - TF**	0	39,184	0	0	0	0	0	TBD	TBD

**This is a new project. Funding was previously included in project 3352. Starting in FY99, funding transfers to PE0603874C. See that PE for FY99-03 funding.

A. **Mission Description and Budget Item Justification**

This project provides core funding for the Joint National Test Facility (JNTF) for the Ballistic Missile Defense Organization's (BMDO) joint missile defense modeling, simulation, and test center of excellence whose focus is the joint inter-service, interoperability, and integration aspects of missile defense system acquisition. It is staffed by all of the Services. The JNTF is the BMDO's level playing field for the resolution of missile defense issues which cut across Service interfaces. The JNTF conducts human-in-the-loop missile defense wargaming for concept of operations (CONOPS) exploration and development. The JNTF also provides simulation, communication connectivity and other JNTF assets in support of BMDO- and CINC-sponsored theater missile defense exercises. Test planning and analysis for Theater Missile Defense (TMD) is conducted at the JNTF. Ballistic Missile Defense (BMD) system-level analysis of missile defense issues is conducted here. The JNTF also performs studies and analysis in support of joint missile defense and provides inter-service computational capabilities and wide area network communication networks with Service facilities.

FY 1997 ($ in Thousands):

- $0 New Project; history reported in PMA 3352.
- $0 Total

FY 1998 ($ in Thousands):

- $21,823 Continue JNTF Recurring Operations & Maintenance (O&M) support for services (such as facility, security, supplies, data management, property management, configuration management, media services, logistics engineering, and quality assurance), computer O&M, communications O&M, program management, software engineering, systems engineering, utilities, and government project personnel and personnel support.
- $9,529 Continue JNTF Nonrecurring Operations & Maintenance support for facility modernization, contract recompetition, physical security upgrades, and information technology improvements and modernization.
- $7,832 Continue JNTF Core Capability support of small, core cadre of experienced personnel to maintain technical expertise for current and expected JNTF responsibilities (such as information systems security engineering, wargaming, command and control simulations, studies and analysis, and research & development management support.
- $39,184 Total

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FY 1999 ($ in Thousands):

- $0 Funding transfers to 0603874C.
- $0 Total

Acquisition Strategy: The tasks in this project are met through full and open competition. The JNTF support contracts were awarded to Loral, now Lockheed Martin, (Operations & Maintenance) and TRW (Research & Development) in FY95; both contracts are Cost Plus Award Fee. Contract Advisory & Assistance Services are provided by Vanguard Research, also awarded in FY95 as Cost Plus Award Fee.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
Appropriated Value		0		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,538		
b. Internal Realignments		40,722		
FY1999 President's Budget	0	39,184	0	39,184

Change Summary Explanation:

Funding: New Project to separately identify JNTF development and operational support to BMDO; formerly in 3352; transferring to PE 0603874C in FY99.

Schedule: None

Technical: None

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C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3353 Joint National Test Facility, PE 0603871C	0	14,466	0	0	0	0	0	Cont	Cont
3353 Joint National Test Facility, PE 0603874C	0	0	54,770	53,221	54,879	57,512	56,063	Cont	Cont
3352 Modeling & Simulation, PE 0603871C	27,240	1,612	0	0	0	0	0	Cont	Cont
3352 Modeling & Simulation, PE 0603872C	30,636	3,981	0	0	0	0	0	Cont	Cont
4151 Personnel & Related Costs, PE 0603873C	0	0	0	0	0	0	0	1,500	1,500

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
TMD Wargame						X						
TMD Tabletop								X				
CINC Exercise Support					X	X	X	X				
TMD System Exerciser Test Support					X	X	X	X				
Joint TMD Planner Support					X	X	X	X				
TMD BM/C4I Modeling					X	X	X	X				
Wargame 2000 Host Support					X	X	X	X				
EADTB Studies Support					X	X	X	X				
BMD Simulation Support Center					X	X	X	X				
Special Program Center Threat Support					X	X	X	X				
Joint Technical Architecture Support					X	X	X	X				
Information Technology Improvement & Modernization					X	X	X	X				

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 3353

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
JNTF Recurring O&M	0	21,823	0
JNTF Nonrecurring O&M	0	9,529	0
JNTF Core Capability	0	7,832	0
Total	0	39,184	0

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
Lockheed-Martin	C/CPAF	FY95	Cont	Cont	0	0	22,999	0	22,999	45,998
TRW	C/CPAF	FY95	Cont	Cont	0	0	8,903	0	8,903	17,806
Vanguard Research	C/CPAF	FY95	Cont	Cont	0	0	5,193	0	5,193	10,386
JNTF	Government	Cont	Cont	Cont	0	0	1,419	0	2,957	4,376
USN NRL	Government	Cont	Cont	Cont	0	0	670	0	670	1,340
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development						39,184		40,722	79,906
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project						39,184		40,722	79,906

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3354 Targets Support	21,736	53,219	21,153	51,975	41,093	41,167	41,129	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project provides core funding for targets and services needed to support the testing and evaluation of all Theater Missile Defense (TMD) programs, in particular THAAD, PATRIOT, PAC3, Navy Area TBMD and Navy Theater -Wide TBMD, USMC Hawk, and the US Air Force Air Borne Laser (ABL). This project is a segment of the BMDO Consolidated Targets Program (CTP). The CTP mission is to provide threat representative ballistic missile target system support to interceptor and sensor development and acquisition programs. Each target system is tailored and configured to meet unique mission requirements for each test. This project funds the development and demonstration of target systems and Foreign Military Acquisition (FMA) targets to support TMD test and evaluation. The TMD programs provide funds to purchase the targets they actually use in their individual tests. The Theater High-Altitude Area Defense (THAAD) system, PATRIOT Advanced Capability - 3 (PAC-3) system, Navy Area TBMD (Lower Tier) and Navy Theater-Wide TBMD (Upper Tier) systems require target system support to accomplish their planned test and evaluation. The THAAD program intends to use the Hera target system with planned launches at White Sands Missile Range (WSMR) including FT. Wingate Launch complex in New Mexico and from Wake Island into the Kwajalein Missile Range (KMR) impact area. Additionally, THAAD testing in the Pacific requires short range (200-600 Km) and long range (1000-2900 KM) target presentations which require development of a short and long range air launched target system. The PAC-3 program will use Storm and Hera targets launched from WSMR and Wake Island. The Navy will use the air launch target launched at Pacific Missile Range Facility (PMRF) (Barking Sands, Kauai, HI). This project is developing a short range (200-600 Km) air launched ballistic target and a long range (1000-2900 Km) air-launched target to satisfy the collective target requirements of THAAD and both Navy programs for multiple simultaneous engagements, multi-axis scenarios, and short range and long-range threat target presentations. The project is also developing reentry vehicles to simulate the full range of threats.

FY 1997 ($ in Thousands):

- $8,500 Continued support of FMA target systems and target development to support TMD test and evaluation.
- $4,856 Continued development and demonstration of Hera and Storm target configurations.
- $2,208 Demonstrated short range air drop target capability to meet requirements.
- $6,172 Technical support for targets program operations.
- $21,736 Total

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FY 1998 ($ in Thousands):

- $27,975 Initiate Dem/Val of Short and Long Range Air Launched Target (LRALT) development.
- $12,900 Continue development and sensor characterization of advanced target payloads.
- $5,559 Provide funding for Wake Island demonstration of Hera.
- $6,785 Provide technical support for targets program operations, including initial definition of ABL target requirements.
- $53,219 Total

FY 1999 ($ in Thousands):

- $7,621 Initiate EMD of Air Launched target development.
- $6,421 Continue development and sensor characterization of advanced target payloads.
- $3,680 Provide funding for Wake Island demonstration of Hera.
- $3,431 Provide technical support for targets program operations.
- $21,153 Total

Acquisition Strategy: The Hera and Storm target systems are being developed by the executing agent: U.S. Army Space and Missile Defense Command (USASMDC), Targets and Test and Evaluation (TT&E) office in Huntsville, AL. The Hera target system, developed by Coleman Research Corporation (Orlando, FL) is being procured with a contract for a quantity of 25 targets. Two additional options are available for procurement of 25 targets in each option. Orbital Sciences Corporation has delivered four Storm Maneuvering Tactical Target Vehicles (MTTV). Additional targets include the Lance target system and Foreign Material Acquisition. The development and demonstration of the air launch ballistic target system is being managed by USASMDC/TT&E office with an Air Force sub-agency arrangement.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	22,842	27,603	18,721	92,212
Appropriated Value		27,603		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-3,548		
b. Internal Realignments		+29,164		
FY1999 President's Budget	21,736	53,219	21,153	119,154

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Change Summary Explanation:

Funding: Resources for this project have been augmented for the development of Air Launch Target and reentry vehicles to simulate the full range of threats. Both are in support of MDAP requirements.

Schedule: None

Technical: None

C. **Other Program Funding Summary ($ in Thousands)**

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2257 PATRIOT, PE 0604865C	381,092	206,057	101,430	0	0	0	0	TBD	TBD
2260 THAAD, PE 0603861C	341,307	2940647	16,778	0	0	0	0	TBD	TBD
2260 THAAD, PE 0604861C	277,508	261,480	578,467	603,213	584,561	413,884	372,674	Cont	Cont
2263 Navy Area System, PE 0603867C	59,315	0	0	0	0	0	0	TBD	TBD
1266 *Navy Theater-Wide System, PE 0603868C	304,171	194,898	192,073	191,229	190,930	145,490	149,444	Cont	Cont
3354 Targets, PE 0603874C	0	0	2,000	2,000	2,000	0	0	TBD	TBD
ABL									

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
HERA supporting TMD-RST I												
HERA Pile Driver Demo												
Lance support to Navy Lower Tier (Area) Tests												
HERA supporting THAAD Dem/Val flight testing	*	*	*									
Lance supporting USMC TBMD tests												
HERA Blk-2B Demo		*										
Willow Dune #1		*										
Willow Dune #2		*										
Short Range Air Launched target Demo	*							X				
STORM/HERA supporting PAC-3 EMD flight testing				*		X	X	X	X	X	X	
Navy Lower Tier (Area) target support										X		
THAAD EMD target support						X		X	X	X		
THAAD AUT										X		
Storm supporting PAC-2			*									
HERA MTV Demo			*									
HERA PMRF Demo								X				
Navy Theater Wide target support								X				

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A. Project Cost Breakdown ($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	Total
Hardware Development	23,046	21,236	53,219	21,153	118,654
Total	23,046	21,236	53,219	21,153	118,654

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
USASMDC						21,711	53,169	21,103	Continued	118,979
Support and Management Organizations										
Test and Evaluation Organizations										
NAWC						25	50	50	Cont	175

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					21,711	53,169	21,103		118,979
Subtotal Support and Management									
Subtotal Test and Evaluation					25	50	50		175
Total Project					21,736	53,219	21,153		119,154

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense PROJECT 3359

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3359 System Test and Evaluation*	38,970	36,191	4,816	5,277	5,817	5,802	5,786	Continuing	Continuing

* Some of the funding in this project transfers to PE 0603873C in FY99.

A. **Mission Description and Budget Item Justification**

This project provides for BMDO planning, oversight, and coordination of integrated Test and Evaluation activities, as well as inter-service Test and Evaluation efforts for assessment of the Family of Systems (FoS). Once the test plans are developed, test resource and target development and support is provided. (Test resources located in Project 3360 include test facilities, ranges and test instrumentation; target development and support is found in Project 3354). The program provides for support to the Major Defense Acquisition Program (MDAP) mandatory Live-Fire Test and Evaluation (LFT&E). This includes estimates of probability of kill of chemical/biological submunitions, creation of models to determine chemical/biological ground effects, confirmation of damage laws from low mass/high-velocity intercepts, confirmation of damage laws from high velocity rods, development of generic lethality targets. Additionally, this project provides the following: independent assessments of the Joint TMD system; maturity evaluation of technology programs; multiple-fidelity models and simulation to support system development testing; and execution of independent technical reviews, system analyses and performance evaluations which contribute to new or enhanced capabilities; management of the development process, and the decision-making process related to the allocation of resources. The performance evaluation has as its primary goals the identification and understanding of system-level performance drivers and the mitigation of technical risk, and to provide timely answers to critical issues and questions required by decision authorities through an annual Consolidated Evaluation Report (CER).

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BUDGET ACTIVITY: 4 - Demonstration and Validation	PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense
	PROJECT: 3359

FY 1997 ($ in Thousands):

–	$17,515	Executed System Integration Test (SIT)-97 at Kwajalein Missile Range in conjunction with the TMD Critical Measurements Program (TCMP) (project 1170) and threat exploitation tests (Willow Dune). SIT-97 included PATRIOT, AEGIS, and USMC HAWK components. Performed HWIL tests and analysis, and performed post-SIT analysis. Integration tests of the Family of System were performed. Completed Build 2 development of TMDSE to include PATRIOT, AEGIS, JTAGS, Shield, TPS-59 (HAWK) Radar, THAAD and Command and Control components. Performed test planning for scheduled SITs.
–	$15,016	Develop generic lethality targets for sled testing of interceptor lethality to support development and live fire test and evaluation. Provide a consistent documentation source for threat lethality target designs. Provide lethality data analyses for target response of HTIC and fragmentation engagements with threat targets to evaluate the effectiveness of TMD interceptors. Initial Verification & Validation of the Post Engagement Ground Effect Model (PEGEM) model for low altitude intercepts.
–	$1,967	(As a result of the realignment, some of the previously planned evaluation activities are now conducted under projects 3251 and 3153.) Executed integrated evaluation plan and methodology. Conductd special studies and technical investigations. Participate in FoS MDAP Test Readiness Reviews. Participated in PAC-3 Test Readiness reviews. Conducted independent assessments of TMDSE testing. Managed operational assessment activities for the TMD FoS and MDAPs. Continued monitoring of THAAD, PAC-3, and NTWDS testing. Provided updated Consolidated Evaluation Report (CER) utilizing current test data from MDAPs, SITs, Joint Exercises, and Wargames, as well as analytical techniques to estimate the TMD system maturity.
–	$3,550	Conducted operational assessment activities for the TMD FoS. Developed critical operational issues, measures of effectiveness, and measures of performance. Developed operational assessment plan for the FoS Command and Control architecture. Performed operational assessment of the FoS System Integration Test.
–	$922	Provided technical support for System Test activities at the Executing Agent.
–	$38,970	Total

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FY 1998 ($ in Thousands):

- $22,380 Transition TMDSE Build 2 to the Joint National Test Facility. Begin Build 3 development of TMDSE which adds THAAD radar Testbed HWIL, multiple AEGIS ships and Patriot elements, and increased fidelity of BMC^3. Perform test planning for scheduled SITs. Perform HWIL tests and analysis in conjunction with the schedule. Plan and execute a mini-SIT 98 using PATRIOT's Large Scale Search and Track test and other TMD assets and conduct post SIT analysis. Integration and interoperability testing of the TMD Family of Systems will be performed. Begin acquiring a target for SIT-00.
- $8,514 Maintain endgame Parametric Endo-Exo Lethality Simulation (PEELS) and postgame (PEGEM) model simulations at current state of knowledge of lethality phenomena. Provide realistic model based on test data and analyses for atmospheric transport, diffusion, deposition, and evaporation of Chemical, Biological Weapon (CBW) agents released from ground level to high altitude. Provide plans to examine lethality as a function of mass and velocity, high velocity phenomena, agent response, and ground effects.
- $1,598 (As a result of the realignment, some of the previously planned evaluation activities are now conducted under projects 3251 and 3153.) Maintain support to execute the Consolidated Evaluation Program and methodology and conduct special studies and technical investigations. Plan FoS test program and draft key program documents, e.g., draft Capstone TEMP and FoS T&E CARD. Participate in THAAD, PAC-3, and NTWDS Test Readiness Reviews. Provide evaluation support to the BMD Acquisition Review Council (BMDARC). Participate in SM-2 Blk IVA Flight Test Readiness Reviews. Provide analyzed test data inputs to support evaluation and analysis for the BMDARC review of PATRIOT for it's DAB and for the Navy Area TBMD UOES. Assess results of HWILT 98 events and TMDSE testing. Support data analysis and review.
- $2,901 Manage operational assessment activities for the TMD FoS. Continue monitoring of THAAD testing. Monitor PAC-3 EMD testing and Navy Area testing. Provide updated inputs to the CER utilizing current test data from MDAPs, SITs, Joint Exercises, and Wargames, as well as analytical techniques to estimate the TMD system maturity.
- $798 Provide technical support for System Test activities at Executing Agent
- $36,191 Total

FY 1999 ($ in Thousands):

- $4,816 Lethality: Maintain endgame Parametric Endo-Exo Lethality Simulation (PEELS) and postgame (PEGEM) model simulations at current state of knowledge of lethality phenomena. Provide realistic model based on test data and analyses for atmospheric transport, diffusion, deposition, and evaporation of Chemical, Biological Weapon (CBW) agents released from ground level to high altitude. Provide plans to examine lethality as a function of mass and velocity, high velocity phenomena, agent response, and ground effects.
- $4,816 Total (Remainder of project transfers to PE 0603873C starting in FY99)

Acquisition Strategy: This effort will use Service executing agents through existing contracts to construct a TMD Family of Systems HWIL capability, TMD System Exerciser (TMDSE) and conduct TMD system level live flight testing. The strategy provides for lethality sled testing managed by BMDO and executed by Service labs against TMD targets. It also provides Service and BMDO system evaluation funding. The evaluation process is an iterative process which should begin early in the development cycle to add value to the development of the system. Critical system characteristics and issues should be identified early in the process and be evaluated to allow for informed decision-making. Family of System evaluations and assessments will be performed by Service OTAs.

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B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	42,792	40,307	26,444	143,111
Appropriated Value		40,307		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-1,798		
b. Internal Realignments		-2,318		
FY1999 President's Budget	38,970	36,191	4,816	113,515

Change Summary Explanation:

Funding: Most of the funding in this project transfers to PE 0603873C starting in FY99. Remaining funding in this PE is for lethality efforts.

Schedule: Changing funding priorities in FY1996 resulted in a TMDSE hardware-in-the-loop Build 2 slip of approximately 6 months. Beginning development of Build 3 slips to FY1998. Completion of Build 3 to FY99. As the result to fact of life MDAP schedules, SIT 99 has been rescheduled to FY00 (SIT 00). THAAD PPQT has slipped as result to THAAD program restructure.

Technical: None

C. Other Program Funding Summary ($ in Thousands)

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
TMDSE Build 1												
HWIL												
SIT		*										
JT&E				*								
TMDSE Build 2				*								
SM2 Blk IVA DT/OT									X			
HWIL Build 2 @ JNTF					X							
Mini-SIT 98						X						
JT&E								X				
HWIL												X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3359

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Family of Systems Test and Evaluation	38,970	36,191	4,816
Total	38,970	36,191	4,816

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
TMDSE						10,651	11,950	0	0	35,265
Support and Management Organizations										
USASSDC						369	337	0	0	706
PEO-MD						553	461	0	0	1,953
SRS Tech	CPFF	1 June 94				1,967	1,598	0	0	7,930
Test and Evaluation Organizations										
BMDO						22,830	19,245	4,816	0	60,911
AFOTEC						200	200	0	0	600
OPTEC						1500	300	0	0	2,550
OPTEVFOR						300	1500	0	0	2,100
JITC						600	600	0	0	1,500

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					10,651	11,950			35,265
Subtotal Support and Management					2,889	2,396			10,589
Subtotal Test and Evaluation					25,430	21,845	4,816		67,661
Total Project					38,970	36,191	4,816		113,515

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DATE: February 1998

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PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3360

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3360 Test Resources**	36,968	61,904	13,788	13,391	13,334	13,283	13,238	Continuing	Continuing

** Some of the funding for this project for FY99-03 will be transferred to PE 0603874C. See that R2 for FY99-03 funding.

A. **Mission Description and Budget Item Justification**

This project provides for BMDO planning, oversight and coordination of integrated test and evaluation facilities. The project includes inter-element as well as inter-service test and evaluation efforts, and provides for ground test facilities, ranges and instrumentation used commonly by TAMD and NMD development programs, and other test resources used only by individual TAMD programs. Project 3360 funds common TMD test resources costs, including BMDO use. Individual programs pay only the direct costs associated with their specific testing efforts.

The ground test facilities include:

Kinetic Kill Vehicle Hardware-in-the-Loop Simulator (KHILS) at Eglin AFB, FL
Aero-Optic Evaluation Center (AOEC) located at Calspan Corp, Buffalo, NY
AEDC Hypervelocity Wind Tunnel Number 9 (Tunnel 9), White Oak, MD
National Hover Test Facility (NHTF) at Edwards AFB, CA
Army Missile Optical Range (AMOR) at the U.S. Army Missile Command, Redstone Arsenal, AL
Infrared and Blackbody Standards at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD.
Hypervelocity Ballistic Range G Light Gas Gun at the Arnold Engineering and Development Center (AEDC) in Tullahoma, TN
Captive Carry Capability at the Nevada Test Site
7V and 10V Space Chambers at the Arnold Engineering Development Center, Tullahoma, TN
Portable Optical Sensor Tester (POST) at Rockwell International, Anaheim, CA
Naval Research and Development (NRaD) facility IR Devices Branch located at the Naval Command, Control and Ocean Surveillance Center, San Diego, CA
The Center for Research Support (CERES) at the Joint National Test Facility, Falcon AFB, CO

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The range facilities include national ranges such as:

White Sands Missile Range (WSMR) located in Las Cruces, NM
Kwajalein Missile Range (KMR) and the Wake Island Complex located in the PacificOcean
Pacific Missile Range Facility (PMRF) and Kauai Test Facility (KTF) located at Kauai, HI
Eglin Gulf Test Range (EGTR) located at Eglin AFB, Fort Walton Beach, FL The range instrumentation special test equipment, data collection assets, and range instrumentation include:

High Altitude Observatory (HALO) with the Infrared Imaging System (IRIS) sensor, based at Aeromet, Inc., Tulsa, OK
Sea-Lite Beam Director (SLBD), based at White Sands Missile Range, Las Cruces, NM
High Altitude Optical Imaging System (HAOIS), based at White Sands Missile Range, Las Cruces, NM.
Mobile Range Safety System and Kwajalein Range Safety Control System
NP-3 Aircraft for remote area safety support.
Miscellaneous improvements to BMDO infrastructures and support systems

These ground test, range and instrumentation assets provide valuable risk reduction and test implementation capability in support of the TMD test and evaluation. The ground test facilities provide a cost effective method of testing and evaluating applicable component, sub-system and system level technologies. The common range facilities provide a cost effective method of flight testing missile and target components applicable to the TMD program and FoS, BMC^3 and interoperability testing. The range instrumentation provides a cost effective capability to collect target signature characteristics, phenomenology data, and target/interceptor diagnostics on flight tests. These facilities and capabilities support systems design, verification and validation of target realism, and the evaluation of test results.

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FY 1997 ($ in Thousands):

–	$13,317	Provided ground test facility infrastructure and upgrades for BMDO testing including: end game hardware-in-the-loop testing of integrated IR sensor systems at KHILS, wind tunnel testing at Tunnel 9 to support THAAD and Navy Sea-Based TBMD programs, EKV and SBIRS sensor testing at POST and NRaD, EKV sensor testing at AEDC 7V/10V, propellant loading expertise and EKV hover test capability from the NHTF, Patriot and Navy lethality testing at AEDC Range G, IR phenomenology characterization at Tunnel 9, AMOR and KHILS; primary IR standards and black body optical materials calibrations at the NIST. Provided LBIR spectral broadband calibration and THAAD window characterization at NIST. Performed THAAD HWIL testing at KHILS. Conducted AIT and Navy Area seeker aero-optic tests at AOEC. Provided orbital experiment and satellite operations support at CERES.
–	$13,356	Provided test range infrastructure including caretaker activities at Wake Island, KTF and WSMR/Ft Wingate, upgrades, and development of TMD launch and range facilities, and associated range instrumentation sites, includes environmental shelter for Wake Island. Continued development of a range standard for intercept debris analysis.
–	$8,453	Provided range instrumentation, upgrades, data collection, and analyses for BMDO testing including: data collecting and processing by SLBD at WSMR and HALO/IRIS sensor. Achieved Future Operational Commitments (FOC) of HAOIS at WSMR and P3 Remote Area Safety Aircraft (RASA). Supported upgraded KMRSS and KMR Range Safety System to support Multiple Shot Engagements. Supported System Integration test SIT 97.
–	$1,550	Provided technical support for Resource activities at BMDO.
–	$292	Provided technical support of Resource activities by the Executing Agent.
–		
–	$36,968	Total

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 3360

FY 1998 ($ in Thousands):

–	$11,230	Provide ground test facility infrastructure and upgrades for BMDO testing including: end game hardware-in-the-loop testing of integrated IR sensor systems including THAAD and Navy Theater Wide TBMD at KHILS, wind tunnel testing at Tunnel 9 to support AIT, sensor testing at POST, NRaD, and AEDC 7V/10V, propellant loading expertise and GBI hover test support from the NHTF, THAAD, PATRIOT and Navy TBMD lethality testing at AEDC Range G, IR phenomenology characterization at Tunnel 9, KHILS, and primary IR standards, and black body and optical materials calibrations at the NIST. Support THAAD flight test anomaly investigation and objective window testing at Tunnel 9. Provide orbital experiment and satellite operations support at CERES and SBIRS Low Flight Demonstration System Support at CERES.
–	$9,104	Provide planning and test range infrastructure, including caretaker activities at Wake Island, KTF, WSMR and Ft Wingate, and upgrades for BMDO testing including development of TMD launch and range facilities, and associated range instrumentation sites, including new development at PMRF and a second environmental shelter at Wake Island.
–	$7,199	Provide range instrumentation, upgrades, data collection, and analyses for BMDO testing including: data collecting and processing by SLBD, HAOI at WSMR and HALO/IRIS sensor. Support FOC of upgraded KMRSS to support Multiple Shot Engagements. Achieve FOC of second NP-3 RASA.
–	$33,024	Provide planning, instrumentation upgrades, and facility improvements at PMRF as well as planning and infrastructure support for the KTF in preparation for JTMD related test activities.
–	$1,347	Provide technical support for Resource activities at BMDO
–	$61,904	Total

FY 1999 ($ in Thousands):

–	$3,400	Provide ground test facility infrastructure and upgrades for BMDO testing at KHILS to support endgame HWIL testing at intergrated IR sensors systems including THAAD, AIT, and Navy Theater Wide TBMD.
–	$6,000	Provide planning, test range infrastructure, and caretaker activities at Wake Island in preparation for Family of Systems (FoS) testing in FY00.
–	$4,388	Provide range instrumentation, upgrades, data collection, and analyses for BMDO testing including: data collecting and processing by SLBD, HAOI at WSMR and HALO/IRIS sensor. Support FOC of upgraded KMRSS to support Multiple Shot Engagements.
–	$13,788	Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY: 4 - Demonstration and Validation	PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense / PROJECT: 3360

Acquisition Strategy: In using ranges and test facilities, BMDO implements a Reliance process which: a) maintains perspective of national technical test capabilities relative to BMD; b) responds to program requirements; c) uses existing test resources where possible; d) requires coordination prior to development of new resources; and e) consolidates management of existing resources where possible and practicable. This policy results in a variety of acquisition methods. Executing Agent Project Managers for the elements and tasks under this project include the three military services and the BMDO. Service Project Manager organizations specifically include : the U.S. Army Space and Strategic Defense Command (USASSDC); the U.S. Navy Office of Naval Research; Navy Ballistic Missile Defense Technology; and the U.S. Air Force Phillips Laboratory. The majority of the ground test facilities are government owned and operated, with some degree of contractor support, and support multiple BMDO users. The test ranges are part of the DoD Major Range and Test Facility Base (MRTFB). The HALO/IRIS sensors are operated by competitively awarded contracts. The SLBD is operated by the U.S. Army (government and contractor personnel); data from SLBD is collected and processed by Federally Funded Research and Development Center (FFRDC) personnel.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	35,507	30,888	30,201	127,735
Appropriated Value		66,888		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-2,569		
b. Internal Realignments		-2,415		
FY1999 President's Budget	36,968	61,904	13,788	143,790

Change Summary Explanation:

Funding: Starting in FY99, facilities/resources which are not unique to TMD are transferred to PE 0603874C, BMD Technical Support.

Schedule: None

Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3360

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1155 Discrimination, PE 0603872C	31,338	37,835	0	0	0	0	0	Cont	Cont
1266 Navy Theater-wide TBMD, PE 0603868C	304,171	194,898	0	0	0	0	0	Cont	Cont
2400 NMD Program, PE 0603871C	828,864	504,091	0	0	0	0	0	Cont	Cont
1270 Advanced Interceptors, PE 0603173C	68,409	31,492	0	0	0	0	0	Cont	Cont
2257 PATRIOT, PE 0604865C	381,092	206,057	0	0	0	0	0	TBD	TBD
2259 Israeli Cooperative Projects, PE 0603872C	43,892	38,715	0	0	0	0	0	TBD	TBD
2260 THAAD System, PE 0603861C	341,307	294,647	0	0	0	0	0	TBD	TBD
2260 THAAD System, PE 0604861C	277,508	261,480	0	0	0	0	0	Cont	Cont
2263 Navy Area TBMD, PE 0604867C	241,330	267,822	0	0	0	0	0	Cont	Cont
3157 Environmental Siting & Fac, PE 0603872C	5,972	3,600	0	0	0	0	0	Cont	Cont
3354 Targets, PE 0603872C	22,842	27,603	0	0	0	0	0	Cont	Cont
3359 System Test and Evaluation, PE 0603872C	42,792	40,307	0	0	0	0	0	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
KDEC Support to THAAD												
AMOR KHILS Support												
TMD Target Sensing at AMOR	*	*	*	*								
ASTP/DIPT Testting at AMOR		*	*	*								
AIT @AOEC		*	*									
AIT tests at AOEC	*	*	*	*								
Navy Area TBMD tests at AOEC		*	*									
WSMR THAAD Dem/Val Tests	*	*	*	*								
HALO/IRIS Data Coll	*	*	*	*	X	X	X	X	X	X	X	X
RCSS Operational Capability (IOC)							X					
KMRSS Intial IOC												
KMR TCMP Launch		*										
AEDC Range G FOC		*	*	*	X	X	X	X				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

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BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3360

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
WSMR Navy SM2-Blk IV Testing												
Tunnel 9 Navy Lower Tier					X	X	X	X				
Tunnel 9 THAAD Support	*	*	*	*	X	X	X	X				
Tunnel 9 Phenomenology Support	*	*		*	X	X	X	X				
THAAD Dem/Val window stress tests at Tunnel 9	*	*										
Tunnel 9 Arrow Support					X	X	X	X				
AIT @ Tunnel 9												
Navy Shroud Deployment at Tunnel 9			*									
Lethality testing at AEDC Range G	*	*	*	*								
HAOIS IOC						X						
KHILS WISP FOC												
10V Chamber IOC												
KHILS HWIL for THAAD	*	*	*	*	X	X	X	X				
KMR Willow Dune Launch		*										
SIT 97		*									X	X
NP-3 RASA IOC		*										
NP-3 RASA C0C							X					
Second NP-3 RASA IOC								X				
PAC-3 WSMR Launch		*	*	*	X	X	X	X				
THAAD LUT					X							
SIT												
CERES FOC												
CERES Satellite Operations Support	*	*	*	*	X	X	X	X				
Red Crow						X						
CERES MSTI					X	X	X	X				
GBI @ AEDC 7V					X	X	X	X				
LEAP/SMX @ AEDC 7V												
NMD/LSI @ AEDC 7V												
BMDO/JIRMP A@ AOEC												
NMD @ NHTF					X	X	X	X				
NHTF Support to THAAD												

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PE NUMBER AND TITLE: 0603872C Joint Theater Missile Defense

PROJECT: 3360

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
NHTF (Hover Ops)					X	X	X	X				
NHTF (GBI)					X	X	X	X				
NHTF (SM-X)						X						
KHILS (TMD)					X	X	X	X	X	X	X	X
KHILS (NMD)					X	X	X	X	X	X	X	X
KHILS (Pre-Launch)					X	X	X	X	X	X	X	X
KHILS (Technologies)					X	X	X	X	X	X	X	X
CERES (RSC Programs)					X	X	X	X				
CERES (Combined Test Force Support)					X	X	X	X				
CERES (SBL Ops Concept Development)						X	X	X				
NIST THAAD Window Characterization	*	*			X	X						
NIST 7V Black Body Calibration						X						
NIST (Calibration Blackbodies for SBIRS)						X	X	X				
NIST (Measure Emissions (NRAD, Sapphire, EKV, Mirror))							X	X				
NIST (Calibrate IR Dectectors (SBIRS, EKV)												
NIST Spectral IR Primary Standard IOC												
Char. Detector Transfer Standards					X	X	X	X				
Calibrate Los Alamos National Lab Blackbody					X	X						
Measure MSX Sphere Spectral Emissivity						X	X					
Post Blackbody Spectral Measurement								X				
Range G (NMD Support)							X	X				
Range G (Navy Theater)								X				
Range G (PAC-3)					X	X	X					
Range G (Phenomenology)					X	X						

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 3360

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Test Facilities	13,317	12,750	3,400
Test Ranges	13,356	44,279	6,000
Test Resources	10,295	4,875	4,388
Total	36,968	61,904	13,788

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
Test and Evaluation Organizations										
USASSDC						13,625	11,653	10,388	Cont	48,400
Air Force						8,667	10,408	3,400	Cont	30,163
NSWC White Oak						8,456	0	0	Cont	11,919
SPAWAR						1,185	1,134	0	Cont	3,733
BMDO						4,835	38,709	0	Cont	49,375
JNTF						200	0	0	Cont	200

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 3360

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation					36,968	61,904	13,788		143,790
Total Project					36,968	61,904	13,788		143,790

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense PROJECT 4000

COST *($ In Thousands)*	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4000 Operational Support**	84,353	73,654	63,243	68,609	78,204	80,605	80,079	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project provides support in three basic areas: personnel and related support costs; funding to meet fluctuation costs and contract terminations; and assistance required to fund support service contracts for the Theater Missile Defense (TMD) program..

Personnel and related support costs common to all TMD projects include support of the Office of the Director, Ballistic Missile Defense Organization and his staff located within the Washington, D.C. area, as well as BMDO's Executing Agents within the US Army Space & Strategic Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office, and the National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits, and infrastructure costs such as rents, utilities, supplies, etc.

The BMDO prioritizes funding within this project to meet operational, contractual, and statutory fiscal requirements for the TMD program. Operational requirements include reimbursable services acquired through the Defense Business Operating Fund (DBOF), such as accounting services provided by the Defense Finance and Accounting Service (DFAS). Contractual requirements include reserves for special termination costs on designated contracts and provisions for terminating other programs as required. BMDO has additional requirements to provide for foreign currency fluctuations on its limited number of foreign contracts. Finally, statutory requirements include funding for charges to canceled appropriations in accordance with Public Law 101-510.

Assistance required to support BMDO overhead management functions for the TMD program is contained in this project. This assistance ranges from operational contracts to fully support functions such as ADP operations, automated tool, Access control offices, and graphics support, to supportive efforts required, as well as to supplement the BMDO government personnel. Typical efforts include cost estimating, security management, contracts management, strategic relations management and information management. These efforts include assessment of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across BMDO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. The requirement for this area is based on most economical and efficient utilization of contractors versus government personnel.

The Fiscal Year 1996 Defense Authorization Act eliminated the management program element effective with the Fiscal Year 1997 President's Budget submission. This overhead management and indirect program support funding has been realigned in accordance with Public Law 104-106.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603872C Joint Theater Missile Defense
	PROJECT 4000

FY 1997 ($ in Thousands):

- $84,353 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $84,353 Total

FY 1998 ($ in Thousands):

- $73,654 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $73,654 Total

FY 1999 ($ in Thousands):

- $63,243 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $63,243 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	82,876	87,516	84,809	255,201
Appropriated Value		87,516		
Adjustments to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, ect.,)		-3,502		
b. Internal Realignments		-10,360		
FY1999 President's Budget	84,353	73,654	63,243	221,250

Change Summary Explanation:

Funding: Management costs realigned to technical program elements effective with FY 1997.
Schedule: None
Technical: None

C. Other Program Funding Summary ($ in Thousands)

D. Schedule Profile

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Family Of Systems Engineering And Integration (FoS E&I) PE 0603873C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603873C Family-of-Systems Engineering and Integration (FoS E&I)

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	96,915	130,289	141,315	155,948	147,810	Continuing	Continuing
3155 TAMD Integration	0	0	25,504	18,173	41,164	37,898	37,672	Continuing	Continuing
3251 Systems Engineering and Technical Support*	0	0	18,594	19,337	21,040	21,648	21,625	Continuing	Continuing
3261 TMD BM/C3I (BM/C3I Concepts)*	0	0	32,082	37,870	43,597	42,281	42,215	Continuing	Continuing
3359 System Test and Evaluation*	0	0	20,735	54,909	35,514	54,121	46,298	Continuing	Continuing

*The funding in this project for FY99-03 was transferred from PE 0603872C. See that R2 for FY96-98 funding.

ARCHITECTURE

A. Mission Description and Budget Item Justification

The Theater Missile Defense (TMD) program's goal is to develop, maintain and deploy a cost-effective, Anti-Ballistic Missile (ABM) Treaty compliant system designed to protect the United States and its Allies against the immediate and growing threat from shorter range theater ballistic missiles. The TMD core programs are PATRIOT Advanced Capability (PAC)-3, Theater High Altitude Area Defense (THAAD) System, and Navy Area Theater Ballistic Missile Defense (TBMD) formerly (Lower Tier) and Navy Theater-Wide TBMD formerly(Upper Tier).

Theater Missile Defense programs, projects, and activities in Advanced Development that have as a primary objective the development of technologies capable of supporting systems, components, and architectures that could produce highly effective defenses against theater missile threats. Includes manpower authorizations and the associated costs specifically identified and measured to the performance of these programs. The projects in this Program Element provide for optimal Theater and Air Missile Defense (TAMD) architectural solutions to address the entire theater level threat. The efforts are directly linked with the architectural definition, design, integration, interoperability, and Test & Evaluation of the TMD Family of Systems.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. Further justification of the Budget Activity code assigned to each Program Element is contained within the Brief Description of Element section of each Program Element Summary.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)

Acquisition Strategy: See Individual R2 summaries.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	96,915	96,915

Change Summary Explanation: See Individual R2 summaries.

Funding: This new PE was created starting in FY99 to realign program content and mangement responsibilities consistent with updated BMDO organizational focus.

Schedule:

Technical:

C. Other Program Funding Summary ($ in Thousands) See Individual R2 summaries.

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile See Individual R2 summaries.

FY 1997				FY 1998				FY 1999			
1	2	3	4	1	2	3	4	1	2	3	4

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3155

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3155 TAMD Integration	0	0	25,504	18,173	41,164	37,898	37,672	Continuing	Continuing

A. **Mission Description and Budget Item Justification**

This project is to provide system engineering, analysis, and technical support for the development of a joint Theater Air and Missile Defense)TAMD) Family of Systems (FoS) architecture. Joint Theater Air and Missile Defense is the integrated capability to detect, classify, intercept and destroy or negate the effectiveness of enemy aircraft and missiles prior to launch or while in flight, to protect US and coalition forces, selected assets, and populations centers within an assigned theater of operations. The TAMD FoS architecture will focus on the integration of theater ballistic missile defense, cruise missile defense, air defense, and attack operations. In addition, BMC4I capability improvements, such development of the Single Integrated Air Picture capability, will be included in this project. A significant amount of effort will also be put on maintaining and upgrading modeling and simulation tools, including CAPS, Extended Air Defense Test Bed (EADTB) and Extended Air Defense Simulation, and further development of the Theater Missile Defense System Exerciser (TMDSE). Support will be provided to Service testing, demonstrations and exercise efforts. The results of the TAMD process will be documented in the TAMD Master Plan which outlines the Operations Architecture, Systems Architecture, and Investment Strategy.

FY 1997 ($ in Thousands):
- $
- $
- $
- $0 Total

FY 1998 ($ in Thousands):
- $
- $
- $
- $0 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3155

FY 1999 ($ in Thousands):

- $7,847 SIAP Definition - Develop an operational and engineering definition of potential material solutions for SIAP, JCTN Integration Analysis, JCTN Gateway Development, Technical Requirements Development, Virtual Distributed Analysis of SIAP requirements and behavior
- $10,153 CMD Integration - Support development of JTAMD Master Plan System Architecture, Acquisition Road Map and Investment Strategy, CMD Baseline analysis, Technology Options plan for 2010, Combat Identification Application analysis, system engineering, engineering and technical trades analysis
- $5,886 Modeling and Simulation Development - Develop TAMD System Specific Representations and advanced modeling and simulation capabilities
- $1,618 Test and Evaluation Support - TAMD Demonstration Plan development and support
- $25,504 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget				
FY1999 President's Budget			25,504	25,504

Change Summary Explanation:

Funding: This new PE was created starting in FY99 to realign program content and mangement responsibilities consistent with updated BMDO organizational focus. The new project for TAMD Integration was created in order to clearly segragate funds. This is in reference to the Department's Program Decision Memorandum regarding BMDO's new role in Cruise Missile Defense.

Schedule:

Technical:

C. Other Program Funding Summary ($ in Thousands)

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3155

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Master Plan Deliverable										X		X
Continuing upgrades to models, EADTB, CAPS, TMDSE												X
SIAP Engineering Definition												X
Master Plan Test and Evaluation Section (Demonstration Annex)												X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603873C Family-of-Systems Engineering and Integration (FoS E&I)

PROJECT: 3155

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
System Engineering	0		25,504
Total			25,504

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
JNTF					0	0		500	cont	500
Support and Management Organizations										
USAF					0	0		1,000	cont	1,000
USA					0	0		1,000	cont	1,000
USN					0	0		1,000	cont	1,000
BMDO					0	0		20,504	cont	20,504
Test and Evaluation Organizations										
JNTF					0	0		500	cont	500
JITC					0	0		1,000	cont	1,000

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3155

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development							500		500
Subtotal Support and Management							23,504		23,504
Subtotal Test and Evaluation							1,500		1,500
Total Project							25,504		25,504

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603873C Family-of-Systems Engineering and Integration (FoS E&I)

PROJECT: 3251

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3251 Systems Engineering and Technical Support*	0	0	18,594	19,337	21,040	21,648	21,625	Continuing	Continuing

*The funding in this project for FY99-03 was transferred from PE 0603872C. See that R2 for FY96-98 funding.

A. **Mission Description and Budget Item Justification**

This project provides system engineering and technical support for the integration of Service-supplied weapon systems to facilitate the identification and resolution of inter-Service integration and interoperability issues; technical and engineering assessments and trade-off studies of Theater Missile Defense (TMD) system architectures and concepts; support for UK developed sensor data fusion methodology; Ballistic Missile Defense (BMD) system survivability oversight and assessment; risk reduction and acquisition streamlining support; modeling, simulation, experiment, and flight test support; development and maintenance of technical and programmatic databases; and preparation of technical reports, briefings, and programmatic documentation associated with TMD studies and critical issues.

FY 1997 ($ in Thousands):
- $
- $
- $
- $0 Total

See PE 0603872C R2 for FY96-98 funding.

FY 1998 ($ in Thousands):
- $
- $
- $
- $0 Total

See PE 0603872C R2 for FY96-98 funding.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3251

FY 1999 ($ in Thousands):

- $4,559 Inter-Service Integration Efforts.
- $14,035 Provide minimum-level system engineering and integration support at the TMD system level to include the following efforts: continue to identify inter-Service integration interfaces; prepare engineering documents that identify changes required in theater air defense C3I systems to incorporate TBMD; upgrade TMD Integrated Test Plan; upgrade system description documents; complete TMD integration trade studies; and plan, coordinate, and analyze C2 wargames for CINC CONOPS development.
- $18,594 Total

Acquisition Strategy: This project uses a combination of FFRDC, competitively awarded SETA contracts, and a Memorandum of Understanding (MOU) with the United Kingdom Ministry of Defense.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	18,594	18,594

Change Summary Explanation:

Funding: This new PE was created starting in FY99 to realign program content and mangement responsibilities consistent with updated BMDO organizational focus. This project was transferred to the new PE from PE 0603872C.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3251

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Engineering Milestone												
T&E Milestone												
Tech Demo Milestone												
Contract Milestone												
- Deliver TMD Sys RD												X
- Deliver TMD Sys Assessment Doc												X
- Deliver TMD Int Test Plan												X
- Deliver TMD C3I Int Assessment												X
- Deliver TMD Surv Assessment												X
- TMD BMC3 WG Plan/Exec											X	X
- TIBS/TRAP Msg Int												X
BMDO EADTB Node Development												
- Node IOC												
- Full distributed Operations										X		
Support through delivery of integration engineering analysis the following TMD events:												
- Navy Area TBMD Def COEA comp												
- Navy Area TBMD Defense MS II												
- THAAD Flight Test												
- Complete NATO Mag Set Tests												
- TMD-GBR Target Tests												
- PAC-3 CDR												
- BPI PDR												
- C3I Integration Test											X	
- System Integration Test												X
- THAAD MS II												
- PAC-3 LRIP Decision												

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3251

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
- BPI KKV CDR												
- MEADS SRR												
- Navy Theater-wide Informed Decision												
- Navy Theater-wide TBMD MS I										X		
- BPI Integration Tests										X		
- THAAD UCT										X		
- UOES Delivery											X	
- PAC-3 MS III												X
- MEADS MS II/III											X	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3251

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Systems Engineering - TMD	0	0	14,035
Systems Engineering - Intra Service	0	0	4,559
Total			18,594

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
SEI - TRW	CPFF	Aug 95				0	0	14,035	Cont	14,035
Sys Eng - USAF						0	0	1,552	Cont	1,552
Sys Eng - USA						0	0	972	Cont	972
Sys Eng - USN						0	0	1,244	Cont	1,244
Sys Eng - BMDO						0	0	544	Cont	544
Sys Eng - JNTF						0	0	247	Cont	247
Test and Evaluation Organizations										
DT&E										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3251

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management							18,594		18,594
Subtotal Test and Evaluation									
Total Project							18,594		18,594

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603873C Family-of-Systems Engineering and Integration (FoS E&I)

PROJECT: 3261

COST (*$ In Thousands*)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3261 TMD BM/C3I (BM/C3I Concepts)*	0	0	32,082	37,870	43,597	42,281	42,215	Continuing	Continuing

*The funding in this project for FY99-03 was transferred from PE 0603872C. See that R2 for FY96-98 funding.

A. Mission Description and Budget Item Justification

The objective of this project is to provide the warfighter with Theater Air and Missile Defense (TAMD) Battle Management/Command, Control, Computers and Intelligence (BM/C4I) that is flexible, responsive, and interoperable. TAMD is based on a Family-of-Systems (FoS) concept where the Services' air and ballistic missile defense and command and control (C2) systems are integrated together using various existing and developing communications capabilities and systems. The resulting FoS provides the CINC with a TAMD systems 'plug and fight' capability to address a wide variety of air and missile threats that can be tailored for his theater of operations.

To achieve this objective of providing the warfighter with flexible, responsive, and interoperable BM/C4I for TAMD, the Ballistic Missile Defense Organization (BMDO) uses this project to provide oversight, leadership, guidance, and support to the Services' TAMD BM/C4I programs. The focus is on Joint approaches to integrate and synergize the Services' programs.

In recent years, this project has been focused on three thrusts: (1) early warning and dissemination of theater ballistic missile launch information, (2) communiction interoperability, and (3) command and control upgrades. In concert with this successful approach, BMDO has developed a TAMD BM/C4I Architecture to enable further improvements in TAMD performance. By focusing project efforts on this architecture, the integration of individual activities will be enhanced while continuing to support earlier objectives.

This TAMD BM/C4I Architecture can be viewed as a set of FoS connectivities and common mission functions integrated via three networks. The first network to be implemented is the Joint Data Network (JDN): a near-real-time network based primarily on the Tactical Digital Information Link [TADIL-J / LINK-16] datalink to provide overall FoS situational awareness, command and control, and weapon coordination. The second network to be implemented is the Joint Planning Network (JPN): a non-real-time/near-real-time network building upon the Global Command and Control System (GCCS) to support centralized planning and guidance. The JPN will complement the JDN by enabling consistent TAMD plan development and dissemination across command levels, Services, and CINCs. The third and final network to be implemented is the Joint Composite Tracking Network (JCTN): a real-time network based on the Navy's Cooperative Engagement Capability (CEC) to directly link sensors and shooters within a theater to provide fire quality information to maximize the synergy of multiple systems.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3261

To achieve the TAMD BM/C4I Architecture, project efforts will address the following key areas: the development of external cueing for FoS sensors; the implementation of JDN [TADIL-J / LINK-16] TMD messages in FoS C2 nodes; and the development and integration of GCCS TMD applications. The overall objective of this project is to ensure the integration of Service systems so that they will be both affordable and interoperable.

FY 1997 ($ in Thousands):

–	$0	See PE 0603872C.
–	$0	Total

FY 1998 ($ in Thousands):

–	$0	See PE 0603872C.
–	$0	Total

FY 1999 ($ in Thousands):

–	$7,473	BM/C3I Integration - Army: Continue integration of THAAD EMD and Navy TMD systems into brigade TOC planner; continue JTIDS Range Extension (JRE) support; and complete MIDS Time Slot Reallocation software upgrade.
–	$11,926	BM/C3I Integration - Air Force: Continue integration of TADIL-J TMD messages onto JSTARS; Continue to support JRE IPT process; Begin JDP 2.0 mission application; Develop TCTA joint implementation concept; Begin Automated Application of Intelligence Preparation of the Battlespace (A2IPB) software integration in TBMCS v2.0 and develop joint implementation concept; Refine individual implementation plans for TSR modifications of joint systems; Begin development of CPM prototype and demonstrate capability; Integrate and test correlation/fusion techniques at a joint exercise..
–	$3,489	BM/C3I Integration - Navy & USMC: Continue support of JTIDS Range Extension and fielding of Joint Defensive Planner.
–	$6,825	BM/C3I Integration - Joint/Combined: Continue JCTN development and update TMD TADIL message sets.
–	$2,369	BM/C3I Integration - JNTF: Continue BM/C3I work shops; perform user assessments of TMD GCCS TMD applications; and continue to support JDP 2.0 VV&A.
–	$32,082	Total

Acquisition Strategy: The 3261 Project acquisition strategy leverages existing system acquisition programs (which are subject to milestone decisions and testing) and accomplishes supporting tasks to satisfy BM/C3I performance requirements. A significant portion of this project entails systems engineering of separately funded and managed service programs so that all systems will interoperate when fielded.

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3261

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	32,082	32,082

Change Summary Explanation:

Funding: This new PE was created starting in FY99 to realign program content and mangement responsibilities consistent with updated BMDO organizational focus. This project was transferred to the new PE from PE 0603872C.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

While this program is not dependent upon funding from other programs, it supports other programs by providing capstone systems engineering, common BM/C3I guidance, interface support, joint network design analysis, and other actions necessary to achieve interoperability among independent systems. In addition to the funds described in this exhibit, funding for Project 3261 has been assigned to the Program Elements as shown below:

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl Complete	Total Cost Complete
3261 TMD BM/C3I PE: 0603872C	30,584	34,865	0	0	0	0	0	Complete	Complete

D. Schedule Profile

See Schedule Profile under PE 0603872C, Project 3261

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3261

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Hardware Development	0	0	10,164
b. Software Development	0	0	12,898
c. System Engineering	0	0	9,020
Total			32,082

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Army PEO-AMD	Allotment	Multiple			0	0	0	7,473	Cont	7,473
Air Force ESC	Allotment	Multiple			0	0	0	11,926	Cont	11,926
Navy PEO(TAD)	Allotment	Multiple			0	0	0	3,489	Cont	3,489
BMDO	MIPRs/Allot	Multiple			0	0	0	6,825	Cont	6,825
JNTF	Allotment	Multiple			0	0	0	2,369	Cont	2,369
Support and Management Organizations										
Test and Evaluation Organizations										
Subtotal Product Development								32,082		32,082

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)	PROJECT 3261

Subtotal Support and Management		
Subtotal Test and Evaluation		
Total Project	32,082	32,082

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603873C Family-of-Systems Engineering and Integration (FoS E&I)

PROJECT: 3359

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3359 System Test and Evaluation*	0	0	20,735	54,909	35,514	54,121	46,298	Continuing	Continuing

*The funding in this project for FY99-03 was transferred from PE 0603872C. See that R2 for FY96-98 funding.

A. Mission Description and Budget Item Justification

This project continues effort previously started under PE 0603872C (for FY96-98) and provides for BMDO planning, oversight, and coordination of integrated Test and Evaluation activities, as well as inter-service Test and Evaluation efforts for assessment of the Family of Systems (FoS). Once the test plans are developed, test resource and target development and support is provided. (Test resources located in Project 3360 include test facilities, ranges and test instrumentation; target development and support is found in Project 3354). The program provides for support to the Major Defense Acquisition Program (MDAP) mandatory Live-Fire Test and Evaluation (LFT&E). This includes estimates of probability of kill of chemical/biological submunitions, creation of models to determine chemical/biological ground effects, confirmation of damage laws from low mass/high-velocity intercepts, confirmation of damage laws from high velocity rods, development of generic lethality targets. Additionally, this project provides the following: independent assessments of the Joint TMD system; maturity evaluation of technology programs; multiple-fidelity models and simulation to support system development testing; and execution of independent technical reviews, system analyses and performance evaluations which contribute to new or enhanced capabilities; management of the development process, and the decision-making process related to the allocation of resources. The performance evaluation has as its primary goals the identification and understanding of system-level performance drivers and the mitigation of technical risk, and to provide timely answers to critical issues and questions required by decision authorities through an annual Consolidated Evaluation Report (CER).

FY 1997 ($ in Thousands):
- $0 See PE 0603872C.
- $0 Total

FY 1998 ($ in Thousands):
- $0 See PE 0603872C.
- $0 Total

FY 1999 ($ in Thousands):
- $16,408 Plan and prepare for execution of SIT-00. Complete TMDSE Build 3 transition to the Joint National Test Facility.

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3359

- $998 Execute Capstone TEMP and methodologies for assessing test issues as part of the FoS test program. Conduct special studies and technical investigations. Participate in PAC-3 Test Readiness Reviews. Provide inputs to the PAC-3 evaluation in support of the BMD Acquisition Review Council (BMDARC) prior to PAC-3 MS III. Participate in SM-2 Blk IVA Flight Test Readiness Reviews. Provide evaluation support to BMDARC for the Navy Area TBMD UOES. Assess results of TMDSE FoS HWIL testing.
- $2,500 Manage operational assessment activities for the TMD system.
- $446 Provide updated CER utilizing current test data from MDAPs and SITs, Joint Exercises, and Wargames as well as analytical techniques to estimate the TMD system maturity.
- $383 Provide technical support for System Test activities
- $20,735 Total

Acquisition Strategy: This effort will use Service executing agents through existing contracts to construct a TMD Family of Systems HWIL capability, TMD System Exerciser (TMDSE) and conduct TMD system level live flight testing. The strategy provides for lethality sled testing managed by BMDO and executed by Service labs against TMD targets. It also provides Service and BMDO system evaluation funding. The evaluation process is an iterative process which should begin early in the development cycle to add value to the development of the system. Critical system characteristics and issues should be identified early in the process and be evaluated to allow for informed decision-making. Family of System evaluations and assessments will be performed by Service OTAs.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	20,735	20,735

Change Summary Explanation:

Funding: This new PE was created starting in FY99 to realign program content and mangement responsibilities consistent with updated BMDO organizational focus. This project was transferred to the new PE from PE 0603872C.

Schedule: As the result to fact of life MDAP schedules, SIT 99 has been rescheduled to FY00 (SIT 00). THAAD PPQT has slipped as result to THAAD program restructure.

Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3359

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
SM-2 Blk IVA DT/OT									X			
JT&E												
Pre-SIT 00 180day Readiness Review												X
HWIL												X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3359

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Systems Engineering & Integration	0	0	20,735
Total	0	0	20,735

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
TMDSE						0	0	12,843	Cont	12,843
Support and Management Organizations										
PEO-MD								383	Cont	383
SRS Tech	CPFF	1 June 94				0	0	998	Cont	998
Test and Evaluation Organizations										
BMDO						0	0	4,011	Cont	4,011
AFOTEC						0	0	500	Cont	500
OPTEC						0	0	700	Cont	700
OPTEVFOR						0	0	600	Cont	600
JITC						0	0	700	Cont	700

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603873C Family-of-Systems Engineering and Integration (FoS E&I)
	PROJECT 3359

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development							20,735		20,735
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project							20,735		20,735

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BMD Technical Operations
PE 0603874C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603874C BMD Technical Operations

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	190,147	161,136	165,802	170,125	166,617	Continuing	Continuing
1155 Discrimination ***	0	0	35,495	25,373	27,711	29,684	31,399	Continuing	Continuing
3153 Systems Architecture and Engineering *	0	0	16,899	16,201	16,330	16,472	16,473	Continuing	Continuing
3352 Modeling and Simulations**	0	0	44,886	33,038	32,499	32,566	29,518	Continuing	Continuing
3353 Joint National Test Facility *	0	0	53,725	51,968	53,406	55,757	54,154	Continuing	Continuing
3354 Targets Support****	0	0	1,962	1,953	1,946	0	0	Continuing	Continuing
3360 Test Resources*	0	0	25,722	20,812	21,869	23,347	22,577	Continuing	Continuing
4000 Operational Support *	0	0	11,458	11,791	12,041	12,299	12,496	Continuing	Continuing

* The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

** The funding in this project for FY99-03 was transferred from PEs 0603173C, 0603871C and 0603872C. See those R-2s for FY96-98 funding.

*** Project title changed to Discrimination (from Phenomenology) in order reflect current program focus on discrimination requirements. The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

**** The funding in this project for FY99-03 was transferred from PE 0603872C. See that R-2 for FY96-98 funding.

A. Mission Description and Budget Item Justification

The Ballistic Missile Defense (BMD) Technical Operations Programs are comprised of the centrally managed functional capabilities required to assure the execution of Theater Missile Defense (TMD), Family of Systems Engineering and Integration (FOS E&I), National Missile Defense (NMD), and Technology programs. Functional areas include phenomenology data collection and analysis, test resources and facilities, modeling and simulation, and BMD architecture analysis. These highly specialized BMD-specific investments provide the threat representative data and derived requirements, modeling capabilities, and test facilities necessary to meet the aggressive development, test, and deployment schedules of the TMD and NMD systems. These centrally managed programs will be executed in a manner integrated with BMDO's mission areas.

The catalyst for reorganization of BMDO PEs, including the creation of this PE, was the fundamental shift in the Department's management approach for both the NMD "3+3" program and TMD "Family of Systems". Technical Operations Programs were formerly distributed and managed within the NMD, TMD, and

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603874C BMD Technical Operations

Technology mission areas. This required OSD and Congress to look across multiple PEs to understand the scope of these investments. Under a single new PE, Technical Operations programs will be more identifiable and managed in a more streamlined manner. The Technical Operations Program Element establishment was accomplished and first reported in BMDO's FY99-03 Program Objective Memorandum submission.

This project is assigned to the Budget Activity and Program Element codes as identified in this descriptive summary in accordance with existing Department of Defense policy. Further justification of the Budget Activity code assigned to each Program Element is contained within the Brief Description of Element section of each Program Element Summary.

Acquisition Strategy: See Individual R-2 summaries.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	190,147	190,147

Change Summary Explanation: See Individual R-2 summaries.
Funding:
Schedule:
Technical:

C. Other Program Funding Summary ($ in Thousands)

See Individual R-2 summaries.

D. Schedule Profile

See Individual R-2 summaries.

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603874C BMD Technical Operations	PROJECT 1155

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1155 Discrimination ***	0	0	35,495	25,373	27,711	29,684	31,399	Continuing	Continuing

***Project title changed to Discrimination (from Phenomenology) in order reflect current program focus on discrimination requirements. The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

A. Mission Description and Budget Item Justification

This project provides the discrimination capability necessary to meet current and responsive BMD threats. This is a critical adjunct to BMD system performance across the full spectrum of threats and engagement scenarios. This program provides data collection sensors and instruments for use on live-fire tests and analysis of the resulting test data. This program provides models of target signatures in both Radar and Infrared spectrums. Signature data and signature models are developed to generate high confidence target signatures for ballistic missile defenses (BMD). This program evaluates and develops algorithms for the critical functions of discrimination, target handover, and aimpoint selection.

Discrimination. This project develops and analyzes detection, tracking, bulk classification, typing, discrimination, target object map generation, aimpoint selection, and kill assessment algorithms. This project directly supports Ground Based Radar (GBR), Ground Based Interceptor (GBI), Theater High Altitude Area Defense(THAAD), Navy Theater Wide (NTW), and Navy Area Defense. The Lexington Discrimination System (LDS) is used to merge radar and optical data analysis on a real-time basis for algorithm development and assessment. Maintenance and upgrades to LDS required to develop and evaluate these algorithms against real and simulated data is provided for in this project. This project includes analysis of radar data from various sources including Cobra Judy.
The Optical Discrimination and Analysis (ODA) program provides accurate, objective, and timely flight test signature analysis of BMDO flight tests. This date provides the basis for the development and evaluation of interceptor seeker algorithms for systems such as THAAD, GBI, Navy Area, and NTW.

This project also provides for participation in international technical exchange programs in the areas of optical and radar discrimination, reentry, and background and plume phenomenology, including: U.S./U.K. Scientific Cooperation Research Exchange (SCORE); use of the UK MESAR Radar; NATO Extended Air Defense (EAD)/TMD Ad Hoc Working Group - Plume Phenomenology Expert Group (U.S., U.K., France, Canada); U.S./French Bilateral Group - Plumes, Backgrounds, and Reentry Signatures; U.S./Israeli TBM Signature and Phenomenology Research; and the U.S./German Phenomenology Research committee.

Signature Models. This project provides high confidence, target and background scene predictions for radars, interceptors, and space based systems. These generated scenes are the foundation for high confidence simulations of engagements that cannot or will not be flight tested. The high-fidelity, physics-based models, predicted composite scenes, and associated analytic output developed in this task are evaluated against measured data to ensure confidence in simulation results and provide a reliable route to systems verification and validation. To facilitate this objective, this task also provides crucial data-driven software tools for exploiting measured data and integrating measurements with simulations in support of technology development, test and evaluation, and acquisition efforts.
Signature data and signature models are developed to generate high confidence target signatures for ballistic missile defenses (BMD).

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Signature Data Collection. This project provides core operating costs for Airborne Surveillance Testbed (AST) target signature collection sensor and test-bed platform. Mission costs for AST are provided by users. This project coordinates other BMDO signature data collection programs to ensure complete coverage and avoidance of duplication.

FY 1997 ($ in Thousands):
- $0 Total

FY 1998 ($ in Thousands):
- $0 Total

FY 1999 ($ in Thousands):
- $14,445 Discrimination: Algorithms from objective systems are evaluated for effectiveness against a variety of threat targets and scenarios. Demonstrate TMD radar/optical discrimination algorithms to finalize EMD algorithms. Continue data analysis support for TMD and NMD systems in Dem/Val and EMD. Continue development of real-time sensor algorithms for resource allocation and multi-sensor fusion. Incorporate new field data sets into the TMD bulk classifiers to adjust parameters for objective system.
- $4,550 Signature Models: Provide signature models validation as analysis of measured data becomes available and understood. Deliver validated signature models for high priority engagement scenarios. Maintain and refine signature models to run with higher computational speed.
- $16,500 Signature Data Collection: Collect infrared signature data on live fire missile flight tests. Provide AST core operating costs to collect optical data of target development flights and intercepts.
- $35,495 Total

Acquisition Strategy: This project funds discrimination, signature models, and signature data collection through executing agents in the Air Force (Phillips Laboratory), Army (Space and Missile Defense Command), and Navy (Naval Research Laboratory) via existing contracts. The executing agents award contracts competitively to the maximum extent possible.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	35,495	35,495

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Change Summary Explanation:

Funding: This project represents the consolidation of technical activities previously reported under PE 0603871C and 0603872C under the project title Phenomenology (1155). Resources for this project have been reduced based on revised FY99-03 program priorities. Funding priorities have reduced this project by approximately 35% over the FYDP.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1155 Discrimination, PE 0603173C	0	0	20,204	10,504	7,540	4,018	3,435	Cont	Cont
2400 Discrimination, PE 0603871C	19,587	18,164	0	0	0	0	0	0	56,492
1155 Discrimination, PE 0603872C	30,919	31,939	0	0	0	0	0	0	99,766

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Deliver new software releases (OSC)									X	X	X	X
Support BMDO test flight programs										X	X	X
Deliver new software releases (SSGM)												X

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	PROJECT 1155

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Prime Contracts	0	0	25,706
OGA	0	0	4,441
Support Contracts	0	0	4,064
Program Management	0	0	1,284
Total			35,495

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Boeing	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	14,800	Cont'd	14,800
MIT/LL	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	5,545	Cont'd	5,545
Xontech	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	2,025	Cont'd	2,025
Miscellaneous	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	6,500	Cont'd	6,500
Support and Management Organizations										
Army SMDC	government	1 Oct 98	Cont'd	Cont'd	0	0	0	898	Cont'd	898
Teledyne Brown	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	1,745	Cont'd	1,745
Nichols Research	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	2,000	Cont'd	2,000
ANSER	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	1,000	Cont'd	1,000
Miscellaneous	CPFF	1 Oct 98	Cont'd	Cont'd	0	0	0	982	Cont'd	982
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management							35,495		35,495
Subtotal Test and Evaluation									
Total Project							35,495		35,495

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BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603874C BMD Technical Operations

PROJECT: 3153

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3153 Systems Architecture and Engineering *	0	0	16,899	16,201	16,330	16,472	16,473	Continuing	Continuing

* The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

A. Mission Description and Budget Item Justification

In January 1997, the BMDO Director established the Office of the Chief Architect/Engineer. This reorganized project ensures that appropriate issues relating to Joint Systems Architecture and Engineering (JSAE) are addressed in a coordinated and synergistic manner across all National Missile Defense (NMD) and Theater Air and Missile Defense (TAMD) efforts. The office reports directly and independently to the BMDO Director to provide the necessary mission-area oversight of critical BMDO technical issues.

Within this project, the BMDO critical JSAE tasks are divided into the areas of Joint Systems Analysis; Baseline and Risk Management; Interfaces and Interoperability (Battle Management/Command, Control, and Communications (BM/C3)); Modeling and Simulation (M&S) Requirements and Standards; Developmental Planning; and Test and Evaluation (T&E). The project provides BMDO with a technical assessment of the expected effectiveness of major programs under development and requirements for supporting technology. Through FY98, the work is funded through two program elements, one for TAMD and the other for NMD.

The primary thrust of the work is to show analytically the need for and expected performance of different defense systems under development to handle current and projected threats. The systems-level architecture/engineering analysis supports efforts to determine the expected operational performance and effectiveness of missile defense systems under development. Models and simulations are used to investigate architecture and system level capability and to resolve critical technical issues related to the development of specific elements of the architecture. Tradeoffs in alternative elements, specific designs, inventory and integration of systems are conducted to determine the most cost effective approach for a particular missile defense mission. Analysis is performed on a continuing basis in order to determine the impact of changing threats, mission requirements, and technological advances. The remaining core JSAE efforts focus on integrating ongoing efforts across the TAMD and NMD mission areas and developing and implementing policies designed to enhance system and cost performance. These efforts help to reduce system and architectural risks, improve system interoperability, focus technology planning and prioritization, and integrate T&E and M&S efforts.

FY 1997 ($ in Thousands):
- $0 Total

FY 1998 ($ in Thousands):
- $0 Total

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FY 1999 ($ in Thousands):

- $12,262 Architecture/Engineering Analysis: Develop an overall analysis plan for the BMDO and oversee the analysis process. Participate in engineering trade studies with the TAMD systems engineer. Perform commonality studies on the Upper Tier TMD systems. Continue systems analysis of architecture/ system performance and related technical issues as directed by Congress, the Department of Defense, the BMDO Director, and the Chief Architect/Engineer. Direct the Joint Systems Engineering Team (JSET). Manage the systems technology implementation process and develop pre-planned program improvement requirements.
- $4,637 Architecture/Engineering Core: Lead BMDO JSAE efforts to develop strategies, policies, and processes. Provide BMDO system-level capability to address emerging system requirements and concerns in a synergistic manner across all NMD and TAMD development efforts and facilitate the translation of operational requirements to joint and combined interoperable systems. Lead BMDO participation in the development and implementation of various BMDO, DoD, Allied, and other Government and commercial initiatives relating to BMDO NMD/TMD BM/C3 development. Conduct Joint Technical Architecture (JTA) compliance engineering; hold T&E Steering Group (TESG) and BMD Operation T&E Council (BOTEC) meetings; oversee High Level Architecture (HLA) compliance and migration; and produce the BMDO Open Systems Assessment and the Test and Experiment Activities Summary (TEAS).
- $16,899 Total

Acquisition Strategy: Systems analysis work in this project is contracted. In November 1995, a two year competitive contract for this work (with two, one year extension options) was awarded to a ten-member corporate team. For other JSAE efforts, expertise of Government, Federally Funded Research & Development Center (FFRDC), System Engineering and Integration Contractor (SEIC), and Scientific, Engineering and Technical Assistance (SETA) personnel are leveraged in the execution of project activities, using existing contracts to the maximum extent possible. Specifically, U.S. Army Space and Missile Defense Command (USASMDC) and USAF/Electronic Systems Center (ESC) Government and contractor personnel lead Information Architecture and development efforts; SETA and SEIC contracts provide the core of technical expertise for a variety of JSAE activities; and FFRDC contract vehicles provide state-of-the-art technical expertise in Software Engineering and related technical areas. Additional contractor services will be procured if needed to meet emerging program requirements.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	16,899	16,899

Change Summary Explanation:

Funding: This project represents a consolidation of technical activities previously reported under PE 0603871C and PE 0603872C under this project title.

Schedule: None

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Technical: In January 1997, the BMDO created the office of the Chief Architect/Engineer, incorporating activities previously funded in this project and adding additional JSAE responsibilities.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program, PE 0603871C	1,989	3,895	0	0	0	0	0	0	8,935
3153 Systems Architecture and Engineering, PE 0603872C	9,051	7,942	0	0	0	0	0	0	26,731

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Test and Experiment Activities Summary									X	X	X	X
BMDO Open Systems Assessment										X		X
TESG									X	X	X	X
BMDO JTA Annual Report												X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Architecture Engineering Analysis	0	0	12,262
JSAE Core	0	0	4,637
Total	0	0	16,899

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
BDM	CPFF/CPAF	27 Dec 94	Cont'd	Cont'd	0	0	0	3,000	Cont'd	3,000
Systems Analysis	CPAF	1 Nov 94	Cont'd	Cont'd	0			8,000	Cont'd	8,000
FFRDC	MIPR	1 Oct 98	Cont'd	Cont'd	0			5,000	Cont'd	5,000
Other Support Contracts		Multiple	Cont'd	Cont'd	0	0	0	899	Cont'd	899
Test and Evaluation Organizations										

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

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Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
continuing					0	0	16,899	Cont'd	16,899
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management							16,899		16,899
Subtotal Test and Evaluation									
Total Project							16,899		16,899

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3352 Modeling and Simulations**	0	0	44,886	33,038	32,499	32,566	29,518	Continuing	Continuing

** FY99 - 03 Funding for this project transferred from PEs 0603173C and 0603872C. See these PEs for FY96-98 activities.

A. **Mission Description and Budget Item Justification**

This project ensures timely availability of reliable, cooperative, and cost-effective BMDO and Service-provided Modeling, Simulation, & Networks (MS&N) tools and capabilities responsive to Ballistic Missile Defense Organization (BMDO) requirements. This project provides for the planning, coordination, program management, and technical oversight of system level Modeling and Simulation (M&S) for the Theater Air and Missile Defense (TAMD) and the National Missile Defense (NMD) Deployment Readiness Programs. This cost effective approach reduces the high cost of missile test programs and generates the information needed to make timely and informed operational, requirements, performance, design/cost/risk tradeoffs, mitigation and resource allocation decisions.

MS&N programs funded by this project include: M&S Roadmap, Mission Oriented Information Technology Resources (ITR), BMDO Data Centers, BMD Virtual Data Center (VDC), the Ballistic Missile Defense (BMD) Simulation Support Center (BSSC), and the infrastructure portion of the Advanced Research Center/Simulation Center (ARC/SC) and the Joint Missile Defense Network (JMDN) that supports the capability to interoperate in a distributed interactive simulation (DIS) environment.

Additionally, this project funds the design and development of Wargame 2000, a simulation to run wargames at the Joint National Test Facility (JNTF) for the next 10 years. The requirements are to: design the simulation using object oriented paradigm, enable "plug and play" of TAMD and NMD models, facilitate integrating BMDO's JNTF internal and external elements into a flexible real-time simulation suite, incorporate more realistic Command and Control (C2) displays, enhance wargaming productivity and responsiveness, and provide for multiple levels of security. Additionally, Verification, Validation, and Accreditation (VV&A) of the Wargame 2000 will be performed in support of the NMD 98-B game.

This project also funds the BMDO Data Center Program. The purpose of the BMDO Data Centers Program is to archive, manage, develop data products, distribute and provide remote access to data from large volumes of scientific and technical data/information generated from experiments, tests, demonstrations, wargaming, simulations, model executions, Analysis of Alternatives (AOA), and evaluations. Operation and management of the Data Center activities are accomplished at four sites: Advanced Missile Signature Center (AMSC), Arnold Engineering and Development Center, Arnold Air Force Base, Tullahoma, TN; Missile Defense Data Center (MDDC), Space and Missile Defense Command, Huntsville, AL; and the BMD SSC, JNTF, Falcon AFB, CO. Each joint data center specializes in a particular discipline related to data management of target discrimination and detection data and is co-located with an existing DoD center of expertise.

In addition to the BMD Data Center functions, the BMD SSC will be BMDO's centralized repository for joint, global and multi-level fidelity M&S tools to seamlessly link with existing and planned simulations or C4I networks, platforms and weapon systems, with little or no apparent differences between simulation and reality. This

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activity will also include the development of a centralized M&S catalogue of data bases to identify current and under-development BMDO simulation tools, and retain the BMDO assessment capability with support from the Services.

This project also provides acquisition and support services for the design, development, modernization and control of BMDO Mission Oriented ITR. The objective for this program is to provide responsive ITR support and services via a flexible, responsive architecture to satisfy validated current and projected user ITR requirements. Projects to be supported via these tasks include the VDC project, the Wargame 2000 initiative, the creation of a comprehensive ITR data base of requirements, and the development of a mission oriented ITR System Architecture that will be responsive to and satisfy these requirements.

The ARC/SC's BMD M&S infrastructure support is also funded via this project. This effort supports integrated simulation for BMD system development and evaluations, and supercomputing resources to operate a multiple test bed environment for conducting research and development activities for Army and Ground Based Elements including Extended Air Defense Test Bed (EADTB), Extended Air Defense Simulation (EADSIM), TAMD System Exerciser (SE), Integrated System Test Capability (ISTC) and the TAMD Theater High Altitude Area Defense (THAAD) System Radar Test Bed.

M&S activities also funded by this project include: development, enhancement, and maintenance of the theater test beds and conduct of wargames that provide the analysis, integration, demonstration, and performance verification for TAMD systems. It ensures joint usage of simulation tool resources, supports allied and friendly international participation and cooperation in wargaming exercises. This project focuses M&S support in four primary areas: assessments, development/modification, computer architectures/networks, and program management for BMDO and Service M&S programs.

FY 1997 ($ in Thousands):

– $0	Total

FY 1998 ($ in Thousands):

– $0	Total

FY 1999 ($ in Thousands):

– $7,756	Provide super-computing resources and infrastructure funds at the ARC/SC to operate a multiple experiment test bed environment for conducting research and development activities for the Army's Ground Based Elements including the EADTB, EADSIM, THAAD Radar Test Bed and the TAMD System Exerciser. Major areas of support include maintenance, modification, and enhancements of/to: Computational Fluid Dynamics (CFD) analysis; AOA of TAMD systems; technical base analysis; concept studies; and alternative trade-off analysis.
– $2,529	Provide funding for Army salaries in support of the ARC/SC and EADTB.

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- $5,087 Provide BMD M&S support in four primary areas: assessments, development/modification, computer architecture/networks, and program management for BMDO and Service M&S programs. Support continued development and refinement of the M&S Roadmap. This area also includes funding for Service M&S activities. Top priorities include continued development and enhancement to the EADTB SSRs and Joint Data Networks (JDN).
- $4,958 Continue to support BMDO's Mission Oriented ITR. Priorities include: continued modernization of BMDO's computer capabilities based on supporting BMD program priorities; continued upgrading of supercomputers to support modeling and simulations; implementation of new technology to support multimedia applications; and replacement of obsolete computational resources.
- $12,885 Provide JNTF Project funding to support continued development of Wargame 2000 and BMD SSC. The Wargame 2000 program will continue to design and develop a "world-class" simulation tool for use in support of CINC wargames and exercises testing operational concepts involving TAMD. Funding will support a Wargame 2000 TAMD Initial Operational Capability (IOC) and a Follow-on capability in FY00.
  The BMD SSC will continue support to TAMD and NMD in the following areas: assist in software development process improvement for M&S, develop processes for testing and improving models and algorithms, incorporate new WEB technologies into the BMD SSC, and update the TAMD, NMD and Building Block M&S catalogs/repositories.
- $11,671 Provide funding to the BMDO Data Centers Program to archive, manage, develop data products, distribute and provide remote access to all relevant BMD data and develop and implement VDC. Specific priorities include: AMSC - provide TAMD Family of Systems (FoS), Navy Theater Wide (NTW) and Navy Area TBMD, SBIRS, and MSX programs data management support, and develop and implement VDC; BDC - provide NTW and Navy Area TBMD, MSX programs data management support, develop and implement VDC; MDDC - provide TAMD FoS, THAAD, PAC-3/PATRIOT, Medium Extended Air Defense System (MEADS), Arrow, NMD Ground Based Interceptor (GBI) data management support; BMD SSC - provide Roaving Sands/Optic Cobra, TMDSE, System Integrated Test (SIT) -98, SIT-00, Wargame 2000, EADTB, NMD BMC3 Data management support, and become the BMDO back-up data center.
- $44,886 Total

Acquisition Strategy: The work in this project is sourced through full and open competition. Primary M&S support is performed at the JNTF, ARC/SC, MDDC, AMSC, BDC, BMD SSC and other test bed facilities. The ARC/SC contractor is a Cost Plus Fixed Fee (CPFF) first awarded in June of 1989. The contract for development and operation of the EADTB was awarded a Cost Plus Award Fee (CPAF) contract in September 1989. The MDDC contractor will be selected under a Small Business Set Aside as a CPAF contract in April 1998.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	
FY1999 President's Budget	0	0	44,886	44,886

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Change Summary Explanation:

Funding: The Virtual Distributed Hardware-in-the-Loop Test Bed (VDHTB) program originally funded by project 3352 has been transferred to project 1155 to align technical responsibilities within the Technical Operations Directorate. Also, due to BMDO's reorganization after the President's Budget Submission last year: the Operation and Maintenance of the JNTF was transferred to a new project (3353); the Mission Oriented ITR was transferred from project 4162 to project 3352; and the BMD Data Center activities were transferred from project 1155 to project 3352. In addition, Wargame 2000 funding from internal BMDO sources was added to this project for years FY99 - 03 based on reoriented BMDO priorities.

Schedule: None.

Technical: None.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2400 NMD Program, PE 0603171C	34,803	6,685	0	0	0	0	0	TBD	TBD
3352 Joint TMD, PE 0603172C	66,409	55,558	11,605	12,013	11,922	11,847	11,836	TBD	TBD
3352 Support Technologies - ATD, PE 0603173C	2,502	5,060	0	0	0	0	0	TBD	TBD

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Update TOM Program Plan									X			
Support NMD 98-B Wargame									X			
Conduct TAMD GBR Software Testing										X		
Conduct TAMD GBR S/W Testing										X		
Update M&S Roadmap												X
Establish and Execute VDC Fully Operational Capability (FOC) Implementation												X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Army Civilian Salaries	0	0	2,529
b. Wargame 2000 and BMD SSC	0	0	12,885
c. BMDO & Service M&S Support	0	0	5,087
d. Mission Oriented ITR	0	0	4,958
e. Advanced Research Center	0	0	5,817
f. Simulation Center	0	0	1,939
g. BMD Data Centers	0	0	11,671
Total			44,886

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Colsa Corp -ARC	SS/CPFF	10/95	Cont	Cont		0	0	5,817	Cont'd	5,817
Madison Research Co - SC	C/CPFF	10/95	Cont	Cont		0	0	1,939	Cont'd	1,939
TRW & Lockheed Martin at JNTF - Wargame 2000	C/CPAF	10/95	Cont	Cont		0	0	12,885	Cont'd	12,885
Vanguard Research	C/CPAF	10/95	Cont	Cont		0	0	1,000	Cont'd	1,000
BDM TR/SR	CPFF/CPAF	12/94	Cont	Cont				800	Cont'd	800

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
MITRE	MIPR	10/93	Cont	Cont				736	Cont'd	736
Raytheon Systems - SSRs	CPFF	3/97	Cont	Cont		0	0	2,551	Cont'd	2,551
TBD - MDDC	CPAF	6/98	Cont	Cont		0	0	3,844	Cont'd	3,844
Sverdrup Tech - AMSC	CPAF	10/96	Cont	Cont		0	0	2,670	Cont'd	2,670
Hughes STX - BCoE	CPFF	9/95	Cont	Cont		0	0	284	Cont'd	284
BCoE Govt Sals	Govt	N/A	Cont	Cont				500	Cont'd	500
NRL (PRA)	CPFF	2/93	Cont	Cont		0	0	411	Cont'd	411
BMD SSC Data Center - JNTF	C/CPAF	10/95	Cont	Cont		0	0	3,962	Cont'd	3,962
Army Salaries	Govt	N/A	Cont	Cont		0	0	2,529	Cont'd	2,529
Lockheed Martin at JNTF - ITR	Comp/CPFF	10/95	Cont	Cont		0	0	4,958	Cont'd	4,958

Support and Management Property

Test and Evaluation Organizations

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program

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Product Development Property	44,886	44,886
Support and Management Property		
Test and Evaluation Property		
Subtotal Product Development	44,886	44,886
Subtotal Support and Management		
Subtotal Test and Evaluation		
Total Project	44,886	44,886

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3353 Joint National Test Facility *	0	0	53,725	51,968	53,406	55,757	54,154	Continuing	Continuing

* The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

A. Mission Description and Budget Item Justification

This project provides core funding for the Joint National Test Facility (JNTF) for the Ballistic Missile Defense Organization's (BMDO) joint missile defense modeling, simulation, and test center of excellence whose focus is the joint inter-service, interoperability, and integration aspects of missile defense system acquisition. It is staffed by all of the Services. The JNTF is the BMDO's level playing field for the resolution of missile defense issues which cut across Service interfaces. The JNTF conducts human-in-the-loop missile defense wargaming for concept of operations (CONOPS) exploration and development. The JNTF also provides simulation, communication connectivity and other JNTF assets in support of BMDO- and CINC-sponsored theater missile defense exercises. The JNTF is the site at which increments of the National Missile Defense (NMD) Battle Management/Command, Control, and Communications (BMC3) capability are hosted. Test planning, implementation and analysis for both NMD and Theater Missile Defense (TMD) are conducted at the JNTF. Ballistic Missile Defense (BMD) system-level analysis of missile defense issues are conducted here. The JNTF also performs studies and analysis in support of joint missile defense and provides inter-service computational capabilities and wide area network communication networks with Service facilities.

FY 1997 ($ in Thousands):
- $0 Total

FY 1998 ($ in Thousands):
- $0 Total

FY 1999 ($ in Thousands):
- $33,053 Provide operations support of network, computer hardware, software, and communication procurement, installation, and maintenance, leased communication lines, systems engineering, security (both personnel and equipment), facility maintenance, government civilian pay, advisory and assistance service to the government, and contractor management services essential to missile defense acquisition.
- $9,831 Modernize and upgrade information resource technology base to maintain the JNTF as a state-of-the-art facility to support joint modeling and simulation, and distributed testing. Provide software process improvement for modeling and simulation, develop processes for testing and improving models and algorithms. Implement facility modernization to support the technology base.

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- $10,841 Provide a core capability of technical expertise that makes the JNTF center of excellence in missile defense acquisition support and allows for fast response on new tasking. Provide analyses expertise to address BMD issues across the entire development and operational spectrum. Provide command and control simulations for TMD and NMD for joint CONOPS development, and missile defense system simulations to CINC exercises. Incorporate new WEB technologies into the BMD Simulation Support Center, and update the TMD, NMD, and building block M&S catalogs/repositories. Provide a missile defense data repository that will archive, manage, develop, distribute, and provide remote access to all relevant BMD test, experiment, M&S, and wargame data.
- $53,725 Total

Acquisition Strategy: The tasks in this project are met through full and open competition. The JNTF support contracts were awarded to an industry contractor for Operations & Maintenance and a separate industry contractor for Research & Development in FY95; both contracts are Cost Plus Award Fee. Contract Advisory & Assistance Services are provided by a third industry contractor, also awarded in FY95 as Cost Plus Award Fee.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	53,725	53,725

Change Summary Explanation:

Funding: FY99-03 funding for this project transferred from 0603871C and 0603872C.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3352 Modeling & Simulation, PE 0603871C	27,724	1,949	0	0	0	0	0	0	40,533
3352 Modeling & Simulation, PE 0603872C	30,892	9,426	0	0	0	0	0	0	73,069
3352 Modeling & Simulation, PE 0603173C	2,002	1,308	0	0	0	0	0	0	3,310
4151 Personnel & Related Costs, PE 0603173C	0	0	0	0	0	0	0	0	1,500
3353 Joint National Test Facility, PE 0603871C	0	8,920	0	0	0	0	0	0	8,920
3353 Joint National Test Facility, PE 0603872C	0	39,184	0	0	0	0	0	0	39,184

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D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
TMD Wargame										X		
TMD Tabletop												X
NMD Wargame/C2 Simulation											X	
NMD Tabletop										X		
CINC Exercise Support									X	X	X	X
TMD System Exerciser Test Support									X	X	X	X
Joint Defense Planner Support									X	X	X	X
TMD BM/C4I Modeling									X	X	X	X
Wargame 2000 Development									X	X	X	X
BMD Simulation Support Center									X	X	X	X
Space Based Infrared Sensor Simulation Development									X	X	X	X
NMD High Fidelity System Simulation Development									X	X	X	X
Threat Scenario Development									X	X	X	X
Information Technology Improvement & Modernization									X	X	X	X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
JNTF Operations Support	0	0	33,053
JNTF Modernization	0	0	9,831
JNTF Technical Capability	0	0	10,841
Total			53,725

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
Lockheed-Martin	C/CPAF	FY95	Cont	Cont	0	0	0	28,339	Cont	28,339
TRW	C/CPAF	FY95	Cont	Cont	0	0	0	11,945	Cont	11,945
Vanguard Research	C/CPAF	FY95	Cont	Cont	0	0	0	8,537	Cont	8,537
JNTF	Government	Cont	Cont	Cont	0	0	0	4,026	Cont	4,026
USN NRL	Government	Cont	Cont	Cont	0	0	0	878	Cont	878
Test and Evaluation Organizations										

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B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management							53,725		53,725
Subtotal Test and Evaluation									
Total Project							53,725		53,725

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3354 Targets Support****	0	0	1,962	1,953	1,946	0	0	Continuing	Continuing

**** The funding in this project for FY99-03 was transferred from PE 0603872C. See that R-2 for FY96-98 funding.

A. Mission Description and Budget Item Justification

This project maintains the Strategic Target System (STARS) motors, components and launch equipment for possible future use as a Theater Missile Defense long range target or a National Missile Defense target.

FY 1997 ($ in Thousands):
- $0 Total

FY 1998 ($ in Thousands):
- $0 Total

FY 1999 ($ in Thousands):
- $1,962 Continue support of STARS target program.
- $1,962 Total

Acquisition Strategy:
The U.S. Army Space and Missile Defense Command (USASMDC) will maintain STARS at a sustainment level to keep the knowledge base and components necessary to launch a STARS target in the future.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget			1,962	1,962

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Change Summary Explanation:

Funding:

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
N/A									

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
N/A												

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A. Project Cost Breakdown ($ in Thousands)

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000
Hardware Development	0	0	0	1,962	1,953
Total	0	0	0	1,962	1,953

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
USASSDC	MIPR	1 Oct 98	Cont.	Cont.	0	0	0	1,962	Cont.	1,962
Support and Management Organizations										
Test and Evaluation Organizations										

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

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Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development							1,962		1,962
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project							1,962		1,962

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3360 Test Resources*	0	0	25,722	20,812	21,869	23,347	22,577	Continuing	Continuing

* The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

A. Mission Description and Budget Item Justification

This project provides for BMDO planning, oversight and coordination of integrated test and evaluation facilities. The project includes inter-element as well as inter-service test and evaluation efforts, and provides for common ground test facilities, ranges and instrumentation. Project 3360 funds those test resources mutually supporting BMDO's NMD and TMD missions. Individual BMDO programs pay only the direct costs associated with their specific testing efforts at these mission common facilities.

The mission common ground test facilities include:

AEDC Hypervelocity Wind Tunnel Number 9 (Tunnel 9) at White Oak, MD
Infrared and Blackbody Standards at the National Institute of Standards and Technology (NIST) in Gaithersburg, MD.
Hypervelocity Ballistic Range G Light Gas Gun at the Arnold Engineering and Development Center (AEDC) in Tullahoma, TN
7V and 10V Space Chambers at the Arnold Engineering Development Center, Tullahoma, TN
Naval Research and Development (NRaD) facility IR Devices Branch located at the Naval Command, Control and Ocean Surveillance Center, San Diego, CA
The Center for Research Support (CERES) at the Joint National Facility, Falcon AFB, CO

The mission common range facilities include national ranges such as:

White Sands Missile Range (WSMR) located in Las Cruces, NM including Ft. Wingate Launch Complex near Gallup, NM
Kwajalein Missile Range (KMR) located in the Pacific Ocean
Pacific Missile Range Facility (PMRF) and Kauai Test Facility (KTF) located at Kauai, HI
Eglin Gulf Test Range (EGTR) located at Eglin AFB, Fort Walton Beach, FL.

The range instrumentation special test equipment, data collection assets, and range instrumentation include:

High Altitude Optical Imaging System (HAOIS), based at White Sands Missile Range, Las Cruces, NM.
Mobile Range Safety System and Kwajalein Range Safety Control System Upgrades
NP-3 Aircraft upgrade for remote area safety support.
Miscellaneous improvements to BMDO infrastructures and support systems

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These ground test, range and instrumentation assets provide valuable risk reduction and test implementation capability in support of TMD and NMD test and evaluation. The ground test facilities provide a cost effective method of testing and evaluating applicable component, sub-system and system level technologies. The common range facilities provide a cost effective method of flight testing missile and target components applicable to the BMD program and TMD Family of Systems (FoS), BMC^3 and interoperability testing. The range instrumentation provides a cost effective capability to collect target signature characteristics, phenomenology data, and target/interceptor diagnostics on flight tests. These facilities and capabilities support systems design, verification and validation of target realism, and the evaluation of test results.

FY 1997 ($ in Thousands):

- 0

FY 1998 ($ in Thousands):

- 0

FY 1999 ($ in Thousands):

–	$7,439	Provide ground test facility infrastructure and upgrades for BMDO testing including: wind tunnel testing at Tunnel 9 to support AIT; sensor testing at AEDC 7V/10V; propellant loading expertise and hover test capability from the NHTF; lethality testing at AEDC Range G; and primary IR standards, black body and optical materials, calibrations at the NIST. Support THAAD flight test anomaly investigation and objective window testing at Tunnel 9. Provide orbital experiment and satellite operations support at CERES.
–	$9,741	Provide test range infrastructure including caretaker activities at WSMR, Ft Wingate, KTF and Meck Island, as well as upgrades for BMDO testing including development of launch and range facilities, and associated range instrumentation sites, including continued development at PMRF and Improvement and Modernization at USAKA/KMR.
–	$6,880	Provide range instrumentation, upgrades, data collection, and analyses for BMDO testing. Support preparations for SIT 00.
–	$1,097	Provide technical support for Resource activities at BMDO.
–	$565	Provide technical support of Resource activities by the Executing Agent.
–	$25,722	Total

Acquisition Strategy: In using ranges and test facilities, BMDO implements a Reliance process which: a) maintains perspective of national technical test capabilities; b) responds to program requirements; c) uses existing test resources where possible; d) requires coordination prior to development of new resources; and e) consolidates management of existing resources where possible and practicable. This policy results in a variety of acquisition methods. Executing Agent Project Managers for the elements and tasks under this project include the three military services and the BMDO. Service Project Manager organizations specifically include: the U.S. Army Space and Strategic Defense Command (USASSDC); the U.S. Navy Office of Naval Research; Navy Ballistic Missile Defense Technology; and the

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U.S. Air Force Phillips Laboratory. The majority of the ground test facilities are government owned and operated, with some degree of contractor support, and support multiple BMDO users. The test ranges are part of the DoD Major Range and Test Facility Base (MRTFB).

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	25,722	25,722

Change Summary Explanation:

Funding: This project represents a consolidation of technical activities previously reported under PE 0603871C and PE 0603872C under this project title. Resources for this project have been reduced based on revised BMDO FY99-03 program priorities. As a result, the following ground test facilities will be funded under this PE: Tunnel 9, NHTF, NIST, Range G and 7V and 10V Space Chambers. Changes within range facilities and instrumentation include the reduced ability to collect and analyze IR data at WSMR, closure of LC-94 facility at WSMR, delays completion of P-3 Flight Safety Support Aircraft, and reduced flexibility in dealing with range issues as they emerge during testing programs.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
1155 Phenomenology Program, PE 0603874C	0	0	35,495	25,373	27,711	29,684	31,399	Cont	Cont
1266 Navy Theater-wide TBMD, PE 0603868C	304,171	419,414	190,446	186,144	183,258	139,273	144,357	Cont	Cont
2400 NMD Program, PE 0603871C	811,416	945,984	962,703	864,435	664,930	359,444	313,406	Cont	Cont
1270 Advanced Interceptors, PE 0603173C	69,848	34,422	32,935	43,083	44,380	53,835	55,622	Cont	Cont
2257 PATRIOT, PE 0604865C	382,808	198,273	137,265	0	0	0	0	TBD	TBD
2259 Israeli Cooperative Projects, PE 0603872C	42,393	50,573	0	0	0	0	0	0	152,318
2259 Israeli Cooperative Projects, PE 0603875C	0	0	37,924	37,716	37,555	0	0	TBD	TBD
2260 THAAD System, PE 0603861C	549,579	393,817	497,752	37,000	5,400	0	0	TBD	TBD
2260 THAAD System, PE 0604861C	66,737	0	323,942	596,310	574,513	602,713	506,663	Cont	Cont
2263 Navy Area TBMD, PE 0604867C	143,343	280,585	245,796	231,592	160,193	50,296	36,792	Cont	Cont
3157 Environmental Siting & Fac, PE 0603872C	6,451	5,062	7,535	3,868	2,942	4,011	3,952	Cont	Cont
3354 Targets, PE 0603872C	21,736	53,219	21,153	51,975	41,093	41,167	41,129	Cont	Cont
3359 System Test and Evaluation, PE 0603872C	38,970	36,191	4,816	5,277	5,817	5,802	5,786	Cont	Cont

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	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3359 System Test and Evaluation, PE 0603873C	0	0	20,735	54,909	35,514	54,121	46,298	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Tunnel 9 THAAD Support									X	X	X	X
WSMR Navy SM2-Blk IV Testing									X	X	X	X
Tunnel 9 Phenomenology Support									X	X	X	X
THAAD Objective Wind Tunnel Testing at Tunnel 9									X	X	X	X
Navy Shroud Deployment and Window Testing at Tunnel 9									X	X	X	X
AIT @ Tunnel 9 (AIT Support)									X	X	X	X
Arrow Support & Tunnel 9									X	X	X	X
GBI @ AEDC 7V									X	X	X	X
LEAP/SMX @ AEDC 7V									X	X		
NMD/LSI @ AEDC 7V											X	
CERES (RSC Programs Support)									X	X	X	X
CERES (Combined Test Force Support)									X	X	X	X
CERES (SBL Ops Concept Development)									X	X	X	X
NIST (Calibrate Blackbodies for SBIRS)									X	X	X	X
NIST (Measure Emissivity (NRAD, Sapphire, EKV Mirror)									X	X	X	X
NIST (Calibrate IR Detectors for SBIRS and EKV)									X	X	X	X
NIST Spectral IR Primary Standard IOC									X	X	X	X
Range G (NMD)									X	X	X	X
Range G (Navy Theater TBMD)									X	X	X	X
Range G(Phenomenology Impact)									X	X	X	X
Second NP-3 RASA IOC									X			
PAC-3 WSMR Launch									X	X	X	

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	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
THAAD LUT										X		
SIT											X	
IFT-3 & 4										X		
IFT-5												X

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A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Project Management	0	0	885
Government Engineering Support	0	0	1,597
Contractor Engineering Support	0	0	2,339
Operation & Maintenance	0	0	2,765
Improvement & Modernization	0	0	1,873
Contractor Technical Support	0	0	1,097
Government Personnel Support	0	0	565
RDT&E Facility Development	0	0	2,865
RDT&E Operation & Support	0	0	6,108
Ancillary/Primary Hardware Development	0	0	2,170
Data Collection	0	0	709
Data Analysis	0	0	887
Software Development	0	0	502
Integrated Logistics Support	0	0	1,181
Travel	0	0	179
Total			25,722

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Support and Management Organizations										
Test and Evaluation Organizations										
USASMDC	MIPR	1 Oct 98	Cont.	Cont.	0	0	0	13,262	Cont	13,262
Air Force	MIPR	1 Oct 98	Cont.	Cont.	0	0	0	5,051	Cont	5,051
SPAWAR	MIPR	1 Oct 98	Cont.	Cont.	0	0	0	677	Cont	677
BMDO	MIPR	1 Oct 98	Cont.	Cont.	0	0	0	6,438	Cont	6,438
JNTF	MIPR	1 Oct 98	Cont.	Cont.	0	0	0	294	Cont	294

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									

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Subtotal Support and Management		
Subtotal Test and Evaluation	25,722	25,722
Total Project	25,722	25,722

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603874C BMD Technical Operations PROJECT 4000

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4000 Operational Support *	0	0	11,458	11,791	12,041	12,299	12,496	Continuing	Continuing

* The funding in this project for FY99-03 was transferred from PEs 0603871C and 0603872C. See those R-2s for FY96-98 funding.

A. Mission Description and Budget Item Justification

This project provides support in three basic areas: personnel and related support costs; funding to meet fluctuation costs and contract terminations; and assistance required to fund support service contracts for the Theater Missile Defense (TMD) program..

Personnel and related support costs common to all TMD projects include support of the Office of the Director, Ballistic Missile Defense Organization and his staff located within the Washington, DC area, as well as BMDO's Executing Agents within the US Army Space & Strategic Defense Command, U.S. Army PEO Missile Defense, U.S. Navy PEO for Theater Defense, U.S. Air Force PEO office, and the National Test Facility. This project supports funding for overhead/indirect personnel costs, benefits, and infrastructure costs such as rents, utilities, supplies, etc.

The BMDO prioritizes funding within this project to meet operational, contractual, and statutory fiscal requirements for the TMD program. Operational requirements include reimbursable services acquired through the Defense Business Operating Fund (DBOF), such as accounting services provided by the Defense Finance and Accounting Service (DFAS). Contractual requirements include reserves for special termination costs on designated contracts and provisions for terminating other programs as required. BMDO has additional requirements to provide for foreign currency fluctuations on its limited number of foreign contracts. Finally, statutory requirements include funding for charges to canceled appropriations in accordance with Public Law 101-510.

Assistance required to support BMDO overhead management functions for the TMD program is contained in this project. This assistance ranges from operational contracts to fully support functions such as ADP operations, automated tool, Access control offices, and graphics support, to supportive efforts required, as well as to supplement the BMDO government personnel. Typical efforts include cost estimating, security management, contracts management, strategic relations management and information management. These efforts include assessment of technical project design, development and testing, test planning, assessment of technology maturity and technology integration across BMDO projects; and support of design reviews and technology interface meetings. Program control tasks include assessment of schedule, cost, and performance, with attendant documentation of the many related programmatic issues. The requirement for this area is based on most economical and efficient utilization of contractors versus government personnel.

The Fiscal Year 1996 Defense Authorization Act eliminated the management program element effective with the Fiscal Year 1997 President's Budget submission. This overhead management and indirect program support funding has been realigned in accordance with Public Law 104-106.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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	PROJECT 4000

FY 1997 ($ in Thousands):
- $0 Total

FY 1998 ($ in Thousands):
- $0 Total

FY 1999 ($ in Thousands):
- $11,681 Continue providing management and support for overhead/indirect fixed costs such as civilian payroll, travel, rents & utilities and supplies.
- $11,681 Total

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	11,458	11,458

Change Summary Explanation:
Funding: Management costs realigned to technical program elements effective with FY 1997.
Schedule: None
Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4

N/A

International Cooperative Programs (Dem / Val) PE 0603875C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 4 - Demonstration and Validation

PE NUMBER AND TITLE: 0603875C International Cooperative Programs

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	50,676	37,716	37,555	0	0	TBD	TBD
1161 Advanced Sensor Technology	0	0	12,752	0	0	0	0	TBD	TBD
2259 Israeli Cooperative Project	0	0	37,924	37,716	37,555	0	0	TBD	TBD

A. Mission Description and Budget Item Justification

This program is in budget activity 4 - Demonstration and Validation, Research Category 6.3B. A new Program Element (PE) was created in accordance with provisions of H.R. 1119; SEC. 233. Cooperative Ballistic Missile Defense Program. This provision calls for the establishment of a PE to be referred to as the "Cooperative Ballistic Missile Defense Program" . The purpose of this program is to support technical and analytical coopeative efforts between the United States and other nations that contribute to ballistic missile defense capabilities.

Acquisition Strategy: See individual R2 Summaries

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY 1999 President's Budget	0	0	50,676	50,676

Change Summary Explanation. This PE was created in response to the cited 1998 Statuatory Language and previously did not exist or were parts of oher BMDO programs

Funding:

Schedule:

Technical:

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile

FY 1997				FY 1998				FY 1999			
1	2	3	4	1	2	3	4	1	2	3	4

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COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1161 Advanced Sensor Technology	0	0	12,752	0	0	0	0	TBD	TBD

A. Mission Description and Budget Item Justification

PE 0603875C was established by Congressional direction to begin in FY99. This effort was previously funded under PE 0603173C.

To prepare for critical future active defense needs, International Cooperative programs will conduct a balanced program of high leverage technologies that yield improved capabilities across a selected range of advanced target sensors, as well as advances in innovative science. The objectives of these investments are subsystems with improved performance, reduced costs for acquisition programs, and technical solution options to counter advanced and unpredicted threats.

Russian American Cooperative Programs:

- The Russian American Observation Satellites (RAMOS) program is an innovative American-Russian space-based remote sensor research and development program addressing ballistic missile defense, national security, and environmental issues. This program engages Russian early warning satellite developers in the joint definition and execution of space experiments. Near-term experiments have focused on planning and executing nearly simultaneous observations of Earth features using U.S. and Russian satellites. The final phase of the near-term experiments include the development of U.S. and Russian instruments for Flying Infrared Signatures Technology Aircraft (FISTA) proof-of-concept measurements. This program investigates options for future cooperation in the joint definition and execution of space experiments to address stereo based early warning and theater missile defense issues, as well as mutual environmental concerns.

  The APEX is an upper atmospheric joint research project with Russian scientists, using Russian and U.S. launch vehicles and US/Russian on-board sensor packages, Russian ground optical/radar sites, and US MSX satellite to monitor experiments and collect data.

FY 1997 ($ in Thousands):

- $0 Prior to FY 1999, the RAMOS and APEX programs were in BA3 - Advanced Technology Development, PE 0603173C, Support Technologies - ATD.
- $0 Total

FY 1998 ($ in Thousands):

- $0 Prior to FY 1999, the RAMOS and APEX programs were in BA3 - Advanced Technology Development, PE 0603173C, Support Technologies - ATD.

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	PROJECT 1161

- $0 Total

FY 1999 ($ in Thousands):

- $12,752 RAMOS - Begins the preliminary design process for the experiment. Defines work package split between the U.S. and Russia concerning launch vehicles, integration planning, mission operations concept, and data analysis capabilities. Begins preliminary design process for the U.S. platform and instruments.
- $0 APEX - Complete flight hardware fabrication, testing, and integration. Conduct plasma cloud experiment to be launched on a US Black Brant 12 from Poker Flat Research Range, Alaska. Collect and analyze data from on-board sensors with corollary data from ground, air, and space based sensors. Begin experiment planning, finalize experiment objectives and criteria for Russian launch early next FY.
- $12,752 Total

Acquisition Strategy: The U.S. prime contractor for RAMOS is the Space Dynamics Laboratory of Utah State University, a designated University Affiliated Research Center for space sensors. SDL has a prime/subcontractor relationship with the Russians. The Russian lead is Rosvoorouzhenie, a State Company, with technical execution done by NPO Cometa and Astrophysica.

RAMOS is a cooperative experiment program developed to engage the Russians in early warning and theater missile defense related technologies. Although possessing moderately strong technical rationale and high-level political support, this program has relied on Congressional plus-ups for execution in FY97 and FY98. The January 1998 Concept Design Review will result in an FY98 decision by OSD/BMDO how to proceed to a space experiment.

The U.S. prime contractor for APEX is the Johns Hopkins University Applied Physics Laberatory (JHU/APL). APL has a prime subcontractor relationship with the Institute for Dynamics of Geospheres (IDG) of the Russian Academy of Sciences, and the Moscow Institute of Heat Technology (MIHT).

APEX is a cooperative experiment program which builds on the success of its predecessor, the Active Geophysical Rocket Experiment (AGRE). Although possessing moderately strong technical rationale and high level political support, it is only currently funded by a Congressional plus-up for execution in FY98.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	12,752	12,752

Change Summary Explanation:

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	PROJECT 1161

In FY99, Funding for the RAMOS and APEX Programs was realigned from BA3, Advanced Technology Development, PE 0603173C Support Technologies to BA4, Demonstration and Validation, PE 0603875C International Cooperative Programs.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
RAMOS												
Define Terms of Agreement												
Contract Signed			X									
Russian Federation Presidential Approval				X		X						
Joint U.S./Russian Obs. (MSX/MSTI/RSESURS-1)	X		X									
Polarization Measurments - FISTA			X	X		X		X				
Concept Design Review						X						
Proof of Concept Sensors - FISTA			X	X								
Proof of Concept Demonstrations							X	X				
Preliminary Design Review										X		
APEX												
Contract ATP						X						
Payload Delivery to Alaska								X				
North Star-1 Launch									X			
Payload Delivery to Russia												X

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603875C International Cooperative Programs	PROJECT 2259

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2259 Israeli Cooperative Project	0	0	37,924	37,716	37,555	0	0	TBD	TBD

A. Mission Description and Budget Item Justification

PE 0603875C was established by Congressional direction to begin in FY99. This effort was previously funded under PE 0603872C, Project 2259.

This project includes the Arrow Deployability Project (ADP), the Israeli Test Bed (ITB), Israeli Cooperative Research & Development (R&D), and the Israeli System Architecture and Integration (ISA&I) Project. The U.S. derives considerable benefits from its participation in these projects. The primary benefits are in U.S. gains in technology and technical information that will reduce risks in U.S. TMD development programs. The U.S. also benefits from the eventual presence of an anti-ballistic missile defense system in Israel, which provides deterrence of future tactical ballistic missile (TBM) conflicts in that region. This defensive system also contributes to a more robust defensive response should deterrence fail.

The Israeli / Arrow program consists of efforts to develop a ballistic missile defense system for Israel. It includes the U.S.-Government of Israel (GOI) initiative to assist the GOI development of an anti-tactical ballistic missile (ATBM) interceptor and launcher. The program also includes an Israeli developed fire control radar (Green Pine), fire control center (Citron tree) and launch control center (Hazelnut Tree). Comprised of three phases, this initiative began with the Arrow Experiments project (Phase I) that developed the preprototype Arrow I interceptor. This was followed by the Arrow Continuation Experiments (ACES) project (Phase II), which is a continuation of Phase I, and consists of critical lethality tests using the upgraded Arrow II interceptor. Arrow provides the basis for an informed GOI engineering and manufacturing decision for an ATBM defense capability. If successful, the Arrow II will satisfy the Israeli requirement for an interceptor for defense of military assets and population centers and will support U.S. technology base requirements for new advanced anti-tactical ballistic missile technologies that could be incorporated into the U.S. theater missile defense (TMD) systems.

The third phase is the ADP, which began in Fiscal Year 1996. This phase of the project will pursue the research and development of technologies associated with the deployment of the Arrow Weapon System (AWS) and will permit the GOI to make a decision regarding deployment (without financial participation by the U.S. beyond the R&D stage). This effort will include system-level flight tests of the total Arrow Weapon System. An interface will be developed for AWS interoperability with U.S. TMD systems. Lethality, kill assessment and producibility will continue to be assessed. Subsequent U.S.-Israeli cooperative R&D on other ballistic missile defense concepts may occur in the future. The ADP was authorized an additional $48M by Congress beginning in FY98 to develop additional User Operational Evaluation Systems (UOES) missiles and to develop the necessary equipment for the AWS to be interoperable with U.S. TMD systems. $12M in additional funds was provided in FY98 under PE 0603872C/Project 2259, and an amended ADP Memorandum of Agreement (MOA) for the Enhanced ADP (EADP) was drafted for coordination and signature by both governments. The remainder of the additional funds, approximately $12M per year for three successive years, was identified as a DoD Program Objective Memorandum (POM) issue, and would require Congressional plus-ups in those years in which POM issues cannot be resolved.

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Since program initiation in 1988, Israel successfully improved the performance of its pre-prototype Arrow I interceptor to the point that it achieved a successful intercept and target destruction in June 1994. Arrow II design and component testing progressed to the successful demonstration of the new warhead, electro-optical seeker, radar fuse, first stage booster, sustainer booster, launcher canister, and launcher. The ADP International Agreement was signed in March 1996 and Presidential certification was completed in May 1996. Thus far, there have been two successful Arrow II intercepts against a threat representative ballistic missile target. In CY98, the Israeli Missile Defense Organization (IMDO) will begin full systems AWS flight testing with the first integrated AWS intercept to occur in late CY98.

The ITB Program is a medium-to-high fidelity theater missile defense simulation that provides the capability to evaluate potential Israeli missile defenses, aids the Israeli Ministry of Defense (IMOD) in the decision of which defense systems to field, provides insights into command and control in TMD, and trains personnel to function in a TMD environment. A structured set of joint U.S./Israeli experiments is being executed to evaluate the role of missile defenses in both mature and contingency Middle East theater operations. This funding also provides for a portion of the operation and maintenance of the ITB and for planned enhancements. Completed experiments identified additional enhancements needed to improve the ITB as an analysis tool. The enhancements incorporated in the ITB to date include radar and weapons models, and a Boost Phase Intercept (BPI) simulation capability. The BPI enhancement benefited the Israeli BPI study completed in January 1996. The Adaptive Battle Management Center (ABMC) enhancement benefits the U.S. by enabling the ITB to simulate a wide variety of command and control and interoperability issues. The planned inclusion of the Distributed Interactive Simulation (DIS) will enable joint exercise experiments to be conducted both in Israel and across the water between US TMD and IS TMD systems.

The ITB became operational in the second quarter of FY 1992. The ITB experiments validated the performance of the prospective near-term Israel Theater Missile Defense System. It provided valuable insight into the potential role of Human-In-The-Loop (HIL) for a TMD system. Also, the Test bed Product Office at the Space and Strategic Defense Command benefited from the application of ITB Project experience to the U.S. and United Kingdom Extended Air Defense Test Bed (EADTB) Projects. The ITB is being utilized to determine Combined Standard Operating Procedures (CSOP) between the US and Israel for TMD.

The Israeli Cooperative R&D program supports the advancement of emerging TMD technologies. This support will advance the technology demonstration phase which will provide for the defense of the State of Israel. It further supports the U.S. technology base needs for these technologies, and furthers the pursuit of interoperability with U.S. TBMD systems. This task supports efforts in developing an interface to allow for interoperability between Israeli TMD systems and U.S. TBMD systems and the implementation of such a system.

The ISA&I tasks provide ongoing analysis and assessment of the baseline, evolutionary, and responsive threats to support the definition and evaluation of an initial Israeli Reference Missile Architecture (IRMA), a baseline missile configuration. Evolutionary growth paths to enhance the IRMA robustness against future threats will be identified. Critical TMD system architecture issues and technologies will be analyzed, and the conformance to established requirements of various Israeli anti-tactical ballistic missile (ATBM) programs, including the Arrow missile development activity, the ADP, and the ITB will be conducted. Finally, previously developed simulations and models will be used selectively to address significant TMD issues. Collectively, the tasks conducted under this cooperatively sponsored ISA&I project will provide critical insights and technical data to both the U.S. and Israeli governments for improving near-term and evolutionary defenses against ballistic missile threats.

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The ISA&I Project activities demonstrated that defense of the State of Israel from tactical ballistic missile (TBM) attacks is feasible and cost-effective. The ISA&I effort analyzed and addressed numerous TMD system issues including HIL, resource allocation, and threat analysis. The U.S. benefited from the architecture analysis work, including identification and progress toward resolution of critical TMD system issues such as kill assessment and the lethality study of a novel interceptor warhead.

FY 1997 ($ in Thousands):

–	$0	Total

FY 1998 ($ in Thousands):

–	$0	Total

FY 1999 ($ in Thousands):

–	$34,399	Arrow Deployability Project and Support. Conduct Benefits Review to determine future ADP plans. Continue AWS integrated flight tests. Continue transfer of the AWS test results to U.S. TMD systems. Continue interoperability, lethality, kill assessment and producibility studies.
–	$1,891	Complete experiments on near-term improvements to the TMD system and on deployability. Provide improved threat model and Arrow II update enhancements. Conduct joint US/IS experiments/exercises.
–	$1,493	Continue to analyze results of ITB Interoperability experiments. Continue performance evaluations of the near-term TMD system based on ADP system flight tests. Continue analysis of TMD refinements for future threats.
–	$141	Gov Project Personnel & Support. Provide funding for project support from USASSDC personnel.
–	$37,924	Total

Acquisition Strategy: This is a cooperative U.S./GOI development program. By completing the Arrow Deployability Project, U.S. TMD programs will be afforded state-of-the-art technical data for program risk reduction and the GOI will have developed information to make a sound Arrow Weapon System deployment decision. The planned ISA&I and ITB efforts will continue to refine the operational tactics and techniques of the fielded near-term TMD system. The U.S. and the GOI, under the umbrella of the various Memoranda of Agreements, share project costs. The U.S. share of total funding is based upon the maturity of the development. Each contract associated with the individual projects is a firm-fixed price (FFP) contract.

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	PROJECT 2259

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	37,924	37,924

Change Summary Explanation:

Funding: PE 0603875C was established by Congressional direction to begin in FY99. This effort was previously funded under PE 0603872C, Project 2259.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3359 - System Test & Evaluation, PEs 0603872C/0603873C	39,575	47,928	36,148	67,037	55,222	69,579	63,110	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
U.S./Israel ADP Agreement signed												
Complete Arrow Interceptor Development												
Complete ITB Enhancements									X			
Complete three Arrow II Flight Tests (ACES)												
Initiate Arrow Weapon System Flight Tests												
Initiate Interoperability Requirements												
Interoperability Tests										X		X
U.S. Benefits Review												X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603875C International Cooperative Programs
	PROJECT 2259

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
Prime Contract (Israel Ministry of Defense)	0	0	32,110
Other U.S. Government Activities	0	0	2,289
US Government Flight Test Support	0	0	0
Software Development	0	0	1,891
Systems Engineering	0	0	1,493
Miscellaneous	0	0	141
Total			37,924

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
SMDC(ITC)	FFP							1,855	3,682	5,537
IMDO (ADP)	Int'l Agmt							32,343	64,110	96,453
Wales, Ltd ISA&I	FPCS							1,465	2,907	4,372
Support and Management Organizations										
Arrow Project Office	MIPRs	Multiple						2,289	4,572	6,861
Test and Evaluation Organizations										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603875C International Cooperative Programs
	PROJECT 2259

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project									

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Threat And Countermeasures Program (Dem / Val) PE 0603876C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876C Threat and Countermeasures Program	PROJECT 3270

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3270 Threat and Countermeasures Program *	0	0	22,113	17,608	23,909	23,720	22,020	Continuing	Continuing

* FY99-03 funding in this project was transferred from PEs 0603871C and 0603872C. See these PEs for FY96-98 activities.

A. Mission Description and Budget Item Justification

Threat and Countermeasures Program. The BMDO Threat Program defines potential adversary military forces missile threats. To accomplish this mission, BMDO has a threat development program which is based on intelligence community projections and is traceable to quantifiable analysis. This project produces capstone threat and countermeasure documentation to ensure consistent technical threat definitions across all the Services. It does not duplicate Service-unique activities. The program consists of three component tasks: Intelligence Threat, Countermeasures Integration, and System Threat Scenario Generation.

Intelligence Threat Task. The purpose of this task is to provide an Intelligence Community-Validated TMDand NMD threat description. The threat is divided into four major categories under this task: Operational Threat Environment, Targets, System Specific Threats (SST), and Reactive Threats. The Operational Threat Environment includes assessments of the operational and technological environments and projects the effects of developments and trends on TMD and NMD mission capability. The Targets category includes a projection of foreign missile systems and countermeasures that enhance their performance. This includes force structure, performance characteristics, and sample signatures. SST addresses threats to the TMD and NMD "family of systems" including reconnaissance, surveillance, and target acquisition; lethal and non-lethal threats; and regional integrated SST assessments. The Reactive Threats category includes those that an adversary may develop as a result of deployment of NMD and the TMD "family of systems."

Threat Applications Task. The accurate specification and characterization of ballistic missiles and the appropriate development and integration of scenarios using these characterizations are critical to the analysis of alternative ballistic missile architectures, the performance assessments of potential technology applications, and the operational performance evaluations of candidate designs. This task provides baseline and excursion scenario descriptions in documentary and digital form for use in BMDO cost and operational effectiveness analyses (COEA). These descriptions are the only approved threat employment portrayals authorized for acceptable BMDO analysis. This task:

Identifies user needs for threat scenario descriptions.
Identifies analyses needed to fully specify and characterize the threat missile systems, penetration aids, tactics, etc., and ensures the analyses are accomplished.
Provides the analysis results to all interested agencies for review and comment.
Addresses critical threat issues which arise during the analysis process.
Ensures all supporting agencies' views on threat issues are fully aired.
Reviews, approves, produces, and distributes all System Threat Scenario Descriptions.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876C Threat and Countermeasures Program PROJECT 3270

Produces threat computer digital media and supporting documentation for use by the development and acquisition communities.

Threat Systems Engineering Task. The BMDO Threat Systems Engineering Program assists TMD and NMD acquisition program offices in developing ballistic missile defense systems that are robust to potential countermeasures and are practical and within the means of anticipated adversaries. Included in this mission are Countermeasures Integrationl Program (CMIP) support to the TMD and NMD threat development process and advance warning to BMDO system designers. The BMDO CMIP reviews TMD and NMD systems for susceptibilities and identifies potential countermeasures, determines credibility through analyses and tests, characterizes credible countermeasures by providing designs and performance parameters, informs intelligence and system threat developers of potential countermeasures, informs TMDand NMD system designers with advance warning of potential countermeasures, and assists TMD and NMD system designers in developing counter-countermeasures. Providing vulnerability and susceptibility information to the system designers early enables them to build robustness into their designs during the early stages of the system development process, a cost-effective means for providing a flexible high-performance design. The program takes a "rest-of-world" perspective in developing credible, potential countermeasures.

FY 1997 ($ in Thousands):

- $0 Total

FY 1998 ($ in Thousands):

- $0 Total

FY 1999 ($ in Thousands):

- $7,281 Intelligence Threat Task: Provide Capstone STAR, specialty threats, targets analyses, operational threat environment intelligence assessments, management, and planning support.
- $6,019 Threat Applications Task: Continue development of threat system characterizations and scenario descriptions in response to the analysis needs of the system/element developers. Upgrade the threat modeling capability and produce digital media and supporting documentation through the JNTF. Develop scenarios depicting threat systems employed in theater environments.
- $8,813 Threat Systems Engineering Task: Perform TMD CM Red/Blue activities and counter-countermeasure parametric studies and TMD CM technical experiments and evaluations. Support CM Skunkworks teams in conducting CM concept, design, fabrication, tests. Conduct non-technical analysis, oversight, and database management.
- $22,113 Total

Acquisition Strategy: Funding is provided to executing agents who accomplish tasks under existing contracts via Military Interdepartmental Purchase Requests (MIPR); Scientific, Engineering, and Technical Assistance (SETA) contracts; and Federally Funded Research and Development Centers (FFRDCs) contracts.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876C Threat and Countermeasures Program PROJECT 3270

B. Program Change Summary ($ in Thousands)

This project represents a consolidation of technical activities previously reported under PE 0603871C and PE 0603872C under this project title.

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	0	0	0	0
FY1999 President's Budget	0	0	22,113	22,113

Change Summary Explanation:

Funding: Funding adjustments made to support revisions in TMD core program schedules and requirements.

Schedule: None

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
3270 Threat and Countermeasures, PE 0603872C	21,012	27,486	0	0	0	0	0	68,363	68,363
2400 NMD Program, PE 0603871C	0	0	393,085	309,748	309,584	391,858	392,433	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Skunkworks Mission #10											X	
TMD/NMD Capstone STAR											X	
Countermeasures Risk Assessment Process											X	
Semi-Annual Update (Starting 3Q/FY96)												

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876C Threat and Countermeasures Program PROJECT 3270

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Intelligence Threat	0	0	7,281
b. Threat Applications	0	0	6,019
c. Threat Systems Engineering	0	0	8,813
Total			22,113

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Support and Management Organizations										
DOE Sandia Lab					0	0	0	2,200		2,200
JNTF-SPC					0	0	0	2,126		2,126
MIT Lincoln Lab					0	0	0	1,957		1,957
CM Tech Eval										
USASSDC					0	0	0	2,000		2,000
Test and Evaluation Organizations										
SPC CM					0	0	0	2,100		2,100
SPC-Threat					0	0	0	1,522		1,522
Nichols-Threat					0	0	0	2,700		2,700
CHOP/Phillips					0	0	0	2,000		2,000
MSIC					0	0	0	900		900

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876C Threat and Countermeasures Program PROJECT 3270

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
NAIC					0	0	0	964		964
BAH					0	0	0	1,931		1,931
ONI					0	0	0	430		430
Miscellaneous					0	0	0	1,283		1,283

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development									
Subtotal Support and Management							22,113		22,113
Subtotal Test and Evaluation									
Total Project							22,113		22,113

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THAAD System (EMD)
PE 0604861C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2260 Theater High Altitude Area Defense	66,737	0	323,942	596,310	574,513	602,713	501,974	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Theater High Altitude Area Defense (THAAD) System Engineering and Manufacturing Development (EMD) phase will refine and mature the Demonstration/Validation (Dem/Val) system design to ensure component and system performance, producibility, and supportability. The EMD contractor will design, develop, fabricate, integrate, assemble, test, check-out, evaluate, document, deliver, and support the THAAD system.

FY 1997 ($0 in Thousands):

- $66,737 Source for reprogramming submitted by OSD transferring funds from EMD to Dem/Val.
- $66,737 Total

FY 1998 ($ in Thousands):

- $0 N/A
- $0 Total

FY 1999 ($ in Thousands):

- $301,090 Award EMD contract. Begin preparation and training for the THAAD Limited User Test (LUT) for the User Operational Evaluation System (UOES). Begin software maintenance. Begin THAAD objective system design. Initiate material purchases for hardware. Continue lethality studies and algorithm development. Continue pursuing integration of THAAD Battle Management/Command, Control, Communications, Computers, Intelligence (BM/C4I) with the Project Manager (PM), Air Defense Command and Control Systems (ADCCS) to take advantage of previous Army developments of force operations software. Includes support for ADCCS to establish test requirements and cases for Computer Software Component integration and test. Participate in Theater Critical Measurements Program (TCMP)-3 to evaluate the Radar and BM/C4I. Participate in System Integration Test (SIT)-2 exercise to evaluate system interoperability. Begin segment level design reviews.
- $792 Support Contracts: Continue task force integration to include family of systems testing and hardware-in-the-loop testing.
- $22,060 Government Furnnished Equipment (GFE)/Other: Procure GFE.
- $323,942 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604861C Theater High-Altitude Area Defense System - TMD
	PROJECT 2260

Acquisition Strategy

The EMD phase contract (missile, launcher, BM/C4I, and Radar) will be a sole source award to the Dem/Val contractor team (as approved September 15, 1995 by USD(A&T)) utilizing the DoD Acquisition Streamlining approach. The contractor team for the EMD phase will become the contractor team for the Low Rate Initial Production (LRIP) and Full Rate Production (FRP) phases. A single prime contractor will have total system performance responsibility for the EMD, LRIP, and FRP.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY 1998/1999 President's Budget	277,508	261,480	578,467	1,117,455
FY1999 President's Budget	66,737	0	323,942	390,679

Change Summary Explanation:

Funding: (-207,021) FY 97: Funds were reprogrammed as a result of perturbations in the DEM/VAL flight test which caused a slip to the DEM/VAL program and corresponding slip to the EMD authority to proceed. BMDO submitted a request to OSD, 16 Jun 97, to reprogram the $66.737M from EMD to Dem/Val. Funds are still not available to the project office for execution.
(-3,750) FY 97: General Reductions
(-261,480) FY 98: Funds were reprogrammed.
(-254,525) FY99: Funds were reprogrammed to 0603861C (THAAD Dem/Val) to pay for flight tests which must be completed prior to THAAD's progression to EMD.

Schedule: The Milestone II DAB Review milestone has slipped due to restructuring the THAAD flight test program (as endorsed by the QDR), including the addition of two more flight tests, and implementing the missile assessment team recommendations.

Technical: None

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2260, THAAD Procurement, SSN C49400	0,000	0,000	0,000	0,000	0,000	0,000	131,952	Cont	Cont
2260, THAAD MILCON, PE 0604861C	0,000	0,000	0,000	0,000	0,000	0,000	4,689	Cont	Cont
2260, THAAD Dem/Val, PE 0603861C	549,579	390,785	497,752	37,000	5,400	0,000	0,000	0,000	3,846,142

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Milestone II											X	
EMD Contract Award											X	
Limited User Test												X

EMD MILESTONES:
Additional UOES Testing Complete-4Q00
UOES - 1Q01
EMD Radar 1 I&T Complete-2Q02
EMD Radar 2 I&T Complete-1Q03
Developmental Tests Begin-1Q03
Low Rate Initial Production Award-2Q04
Developmental Tests/Operational Tests Complete-1Q05
Initial Operational Test & Evaluation Complete-4Q06
First Unit Equiped - 4QFY06
Milestone III-2Q07

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. Prime Contract	66,737	0,000	301,090
b. Other Government Activities	0,000	0,000	22,060
c. Support Contracts	0,000	0,000	792
d. Program Management	0,000	0,000	0,000
e. Targets	0,000	0,000	0,000
f. Lethality	0,000	0,000	0,000
g. OT&E	0,000	0,000	0,000
Total	66,737		323,942

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
LMMS	CPFF/SS	Jun 99			0,000	66,737	0,000	301,090	Cont	367,827
Support and Management Organizations										
SETA					0,000	0,000	0,000	0,000	Cont	
Other Spt Cont					0,000	0,000	0,000	792	Cont	792
OGAs					0,000	0,000	0,000	0,000	Cont	
Program Mgmt					0,000	0,000	0,000	0,000	Cont	
Test and Evaluation Organizations										
WSMR/USAKA					0,000	0,000	0,000	0,000	Cont	

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604861C Theater High-Altitude Area Defense System - TMD PROJECT 2260

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
OT&E					0,000	0,000	0,000	0,000	Cont	
Targets					0,000	0,000	0,000	0,000	Cont	
Lethality					0,000	0,000	0,000	0,000	Cont	

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
JTIDS				0,000	0,000	0,000	5,851	Cont	Cont
Joint Tactical Terminal							1,197	Cont	Cont
Heavy HMMWV							1,147	Cont	Cont
S-788 Shelter							1,147	Cont	Cont
DRU							1,707	Cont	Cont
PLS							3,448	Cont	Cont
Miscellaneous							7,563	Cont	Cont
Support and Management Property									
N/A				0,000	0,000	0,000	0,000	Cont	Cont
Test and Evaluation Property									
N/A				0,000	0,000	0,000	0,000	Cont	Cont
Subtotal Product Development					66,737	0,000	323,150	Cont	Cont

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)			DATE: February 1998
BUDGET ACTIVITY: 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE: 0604861C Theater High-Altitude Area Defense System - TMD		PROJECT: 2260

Subtotal Support and Management	0,000	0,000	792	Cont	Cont
Subtotal Test and Evaluation	0,000	0,000	0,000	Cont	Cont
Total Project	66,737	0,000	323,942	Cont	Cont

PATRIOT Advanced Capability-3 Missile (EMD)
PE 0604865C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE: February 1998

BUDGET ACTIVITY: 5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE: 0604865C Patriot PAC-3

PROJECT: 2257

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2257 Patriot PAC-3	382,808	198,273	137,265	0	0	0	0	0	1,362,719

A. **Mission Description and Budget Item Justification**

PATRIOT is a long-range, mobile, field Army and Corps air defense system, which uses guided missiles to simultaneously engage and destroy multiple targets at varying ranges. The PATRIOT Advanced Capability Level 3 (PAC-3) Upgrade Program is the latest evolution of the phased material change improvement program to PATRIOT. The material changes will provide improved performance across the spectrum for system and threat intercept performance. The material changes include a new PAC-3 missile (previously known as ERINT), remote launch capabilities, communications and computer/software improvements, and radar upgrades to enhance system performance by improving its multi-function capability for tracking, and target handling capability against ballistic and cruise missile threats. The PATRIOT operates as the lower tier of the Army's Theater Missile Defense (TMD) task force and is developing the capacity to interact with the Navy Cooperative Engagement Capability (CEC) system. PATRIOT is pursuing integration of PATRIOT Battle Management Command, Control, Communications and Intelligence (BMC3I) with the Project Manager, Air Defense Command and Control Systems to take advantage of previous Army developments that can be incorporated into the PATRIOT program.

FY 1997 ($ in Thousands):

- $291,608 Continued PAC-3 missile EMD program and formal flight testing.
- $27,291 Continued PAC-3 EMD target and test support, including target build-up for FY98 testing.
- $18,382 Continued operational test and evaluation and lethality efforts.
- $45,527 Continued ground systems modifications development program.
- $382,808 Total

FY 1998 ($ in Thousands):

- $154,557 Continue PAC-3 missile EMD program with formal flight testing.
- $24,046 Continue PAC-3 EMD target and test support, provide target presentation at White Sands Missile Range (WSMR) New Mexico.
- $15,028 Continue operational test and evaluation and lethality efforts.
- $4,642 Complete modifications development program.
- $198,273 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604865C Patriot PAC-3
	PROJECT 2257

FY 1999 ($ in Thousands):

- $121,480 Complete PAC-3 Missile EMD program.
- $11,016 Complete PAC-3 EMD target and test support.
- $4,769 Complete PAC-3 operational test and evaluation and lethality efforts.
- $137,265 Total

Acquisition Strategy: The PAC-3 Upgrade Program will provide enhancements to the current PATRIOT system through a series of upgrades divided into three configurations which will be individually tested and procured. Missile and ground equipment configurations will be fielded through hardware retrofit and concurrently released software builds. During EMD, an expanded risk reduction/mitigation program (PE: 0604866C, Proj: 2257) was implemented to address areas of risk identified during the Dem/Val phase. The PAC-3 Risk Reduction and Mitigation program is a multi-faceted effort involving two prime contractors and three contracts. The risk reduction/mitigation modification efforts are for existing EMD contracts with each of the two prime contractors.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY 1998/1999 President's Budget	381,092	206,057	101,430	1,041,126
Appropriated Value		206,057		
Adjustment to Appropriated Value:				
a. General Reductions (FFRDC, Inflation, etc,)		-7,784		
b. Internal Realignments		0		
FY 1999 President's Budget	382,808	198,273	137,265	1,070,893

Change Summary Explanation:

Funding: FY 1998 (- 7,784): Project decremented for Defense-Wide reductions/recissions.
FY 1999: (+35,835) was reprogrammed from Procurement to cover R&D shortfalls.

Schedule: None.

Technical: None.

C. Other Program Funding Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2257, PAC3 Procurement, PE 0208865C	219,038	341,300	343,235	446,737	431,543	417,973	381,306	525,170	3,862,666
2257, Risk Reduction Mitigation, PE 0604866C	0	0	0	0	0	0	0	0	92,686
2257, Major MILCON, PE 0603865C	0	0	0	0	0	0	0	0	1,349

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604865C Patriot PAC-3
	PROJECT 2257

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Configuration 1 First Unit Equipped(FUE)												
PAC-3 Missile CDR												
Configuration 2 Contractor Development Test and Evaluation (CDT&E)												
Configuration 2 Follow-On Test and Evaluation (FOT&E)												
PDB-4 Software Release	*											
Configuration 2 FUE	*											
Controlled Test Flight 1				*								
Controlled Test Flight 2					*							
Guidance Test Flight 1						X						
PAC-3 Missile Low-Rate Initial Production (LRIP) Decision						X						
Configuration 3 CDT&E							X					
Configuration 3 Initial Operational Test and Evaluation (IOT&E)										X		
PDB-5 Software Release												X
PAC-3 FUE												X
Milestone III Full Rate Production (FRP) Decision												X

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604865C Patriot PAC-3
	PROJECT 2257

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
PAC-3 EMD	382,808	198,273	137,265
Total	382,808	198,273	137,265

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations										
Raytheon (CDI III)	SS-CPIF	Jul-93	70,808	70,808	48,550	4,808	0	0	0	53,358
Raytheon Remote Launch/Common	SS-CPIF	Nov-95	66,500	66,500	3,000	33,513	4,642	0	0	41,155
Raytheon (Integr)	SS-CPIF	Oct-94	136,132	136,132	20,239	56,500	18,793	10,600	0	106,132
LMVS (EMD)	SS-CPIF	Oct-94	677,400	677,400	168,948	168,352	84,000	56,100	0	477,400
RDEC (OGA)					10,355	13,462	8,500	9,958	0	42,275
Support and Management Organizations										
Nichols	MIPR		11,111	11,111	3,040	4,681	0	0	0	7,721
CAS	SS-CPIF				4,850	5,901	6,550	6,223	0	23,524
OGA/In-house	PO				8,805	16,137	9,424	10,201	0	44,567
Raytheon (E/S)	SS-CPIF				12,047	17,039	10,973	11,333	0	51,392
Govt Proj Per & Spt					0	434	434	0	0	868

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE: 0604865C Patriot PAC-3

PROJECT: 2257

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Test and Evaluation Organizations										
WSMR/ARL	MIPR				8,555	16,742	15,883	17,065	0	58,245
OT&E	MIPR				600	2,570	6,290	1,505	0	10,965
Targets	MIPR				0	27,291	24,046	11,016	0	62,353
Lethality	MIPR				2,837	15,378	8,738	3,264	0	30,217

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development				251,092	276,635	115,935	76,658		720,320
Subtotal Support and Management				28,742	44,192	27,381	27,757		128,072
Subtotal Test and Evaluation				11,992	61,981	54,957	32,850		161,780
Total Project				291,826	382,808	198,273	137,265		1,010,172

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Navy Area Missile Defense (EMD)
PE 0604867C

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604867C Navy Area		PROJECT 2263

COST ($ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2263 Navy Area	143,343	278,790	245,796	231,592	160,193	50,296	36,792	Continuing	Continuing

To see the other Program Elements and Appropriations associated with Navy Area TBMD, see section C of this R2.

A. Mission Description and Budget Item Justification

The Navy Area Theater Ballistic Missile Defense (TBMD) project builds on the national investment in AEGIS ships, weapon systems, and Navy Standard Missile II (SM-2) Block IV missiles. Two classes of ships continue to be deployed with the AEGIS combat system: the CG-47 Ticonderoga-class cruisers and the DDG-51 Burke-class destroyers. Navy TBMD will take advantage of the attributes of naval forces including overseas presence, mobility, flexibility, and sustainability in order to provide protection to debarkation ports, coastal airfields, amphibious objective areas, Allied forces ashore, and other high value sites. Navy assets will provide an option for initial TBMD allowing the insertion of additional land-based TBMD assets and other expeditionary forces in an opposed environment.

FY 1997 ($ in Thousands):

- $135,104 Continued systems engineering and analysis. Continued development of User Operational Evaluation System (UOES) and tactical computer programs; initiated development of computer program design specifications for the Tactical Program; conducted Tactical Program system design review (SDR); conducted UOES critical design review (CDR). Continued detailed missile design. Continued procurement and fabrication of Engineering and Manufacturing Development (EMD) test rounds. Provided technical support for AEGIS weapon system design activities. Continued test planning. Continued testing in support of Live Fire Test & Evaluation (LFT&E). Initiated procurement of high fidelity sled track test targets for the FY98-99 LFT&E. Continued to design the interface for TBMD-related upgrades to AEGIS and Joint Maritime Command Information System (JMCIS). Continued Command and Control Processor (C2P) development.
- $6,739 Continued required lethality analyses and lethality model refinements.
- $1,500 Continued building, and delivery of, targets to support Navy TBMD flight tests. Maintained infrastructure to support TMD targets.
- $143,343 Total

FY 1998 ($ in Thousands):

- $262,105 Continue tactical computer program development; deliver AEGIS UOES computer program; conduct tactical program preliminary design review (PDR) and critical design review (CDR). Continue Engineering/Manufacturing development of the missile. Begin delivery of Inert Operational Missile(IOM)/Engineering Design Model (EDM) test rounds and White Sands Missle Range (WSMR) New Mexico flight test missiles. Initiate fabrication of UOES missiles. Provide technical support for AEGIS Weapon System design activities. Continue LFT&E activities. Continue Systems Engineering and Analysis. Continue implementation of JMCIS TBMD segments and TBMD messages in C2P.
- $6,608 Continue required lethality analyses and lethality model refinements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604867C Navy Area
	PROJECT 2263

- $10,077 Continue building and delivery of targets to support Navy TBMD flight tests. Maintain infrastructure to support TMD targets.
- $278,790 Total

FY 1999 ($ in Thousands):

- $200,538 Continue tactical computer program development. Integrate EMD IOM round into AEGIS UOES computer program. Continue EMD of the missile. Continue delivery of IOM/EDM test round, WSMR flight test missiles and UOES/EMD missiles. Begin Developmental Testing (DT) of missile at WSMR. Continue LFT&E activities. Continue implementation of JMCIS TBMD segments and TBMD messages in C2P.
- $5,689 Continue required lethality analyses and lethality model refinements.
- $39,569 Continue building and delivery of targets to support Navy TBMD flight tests. Maintain infrastructure to support TMD targets.
- $245,796 Total

Acquisition Strategy: This strategy consists of a Navy Area TBMD Program evolving to a Theater-Wide Defense TBMD program. The Navy Area Program will build on existing force structure by modifying the SM-2 Block IV missile and AEGIS Combat System to achieve TBMD capability.

B. Program Change Summary ($ in Thousands)

	FY 1997	FY 1998	FY 1999	Total Cost
FY1998/1999 President's Budget	241,330	267,822	226,748	735,900
Appropriated Value		289,822		
Adjustments to Appropriated Value				
a. General Reductions (FFRDC, Inflation, etc,)		-11,032		
b. Internal Realignments		0		
FY1999 President's Budget	143,343	278,790	245,796	667,929

Change Summary Explanation:

Funding: SM-2 Blk IVA design immaturity and Delays in the risk reduction flight tests necessitated several minor internal funding realignments, followed by a program restructure and an FY97 Congressional reprogramming from P.E. 0604867C (EMD) to P.E. 0603867C (Dem/Val) as the start of EMD was delayed from original date of December 1995 until February 1997. FY97 also reflects one miscellaneous OSD reduction and two internal BMDO funding realignments. FY98-99 increases reflect the February 1997 Defense Acquisition Board (DAB) funding profile including additional UOES testing and EMD contract negotiations/cost growth. FY98 changes also include undistributed Congressional marks included in the FY98 Defense Appropriations Bill. FY99 changes also include a general reduction due to inflation.

Schedule: APB approved February 1997

Technical: None

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604867C Navy Area
	PROJECT 2263

C. Other Program Funding Summary ($ in Thousands)

Note: Excludes Navy WPN funds for SM-2 Block IVA Missile Procurement

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
2263, Navy Area TMD (Dem/Val), PE 0603867C	157,028	0	0	0	0	0	0	0	763,627
AEGIS Combat System (Procurement) P.E. 0208867C - BMDO TOA	9,151	15,058	43,318	60,313	72,390	60,214	56,221	Cont	Cont
SM-2 Block IVA (Procurement) P.E. 0208867C -BMDO TOA	0	0	0	65,366	82,644	166,393	159,559	Cont	Cont
SM-2 Block IVA (Procurement) WPN 1507, BA 2 - US Navy TOA	0	0	0	80,292	101,126	126,969	140,499	Cont	Cont

D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
Acquisition Milestones:												
- Acquisition Milestone II		*										
Engineering Milestones:												
- AEGIS Combat System (ACS) Preliminary Design Review (PDR)												
- SM-2 BLK IVA PDR												
- ACS PDR (Tactical)					*							
- ACS CDR (Tactical)								X				
T & E Milestones:												
- White Sands Missile Range NM (DT/Operation Assessment)										X		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604867C Navy Area
	PROJECT 2263

Milestones Beyond FY 1999

- LRIP Decision	3rdQFY00
- FUE	1stQFY02
Acquisition Milestone III	2ndQFY02

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604867C Navy Area PROJECT 2263

A. Project Cost Breakdown ($ in Thousands)

	FY 1997	FY 1998	FY 1999
a. System Engineering	20,539	45,920	23,332
b. Program Management	3,565	6,963	5,895
c. Program Support	3,395	6,428	5,442
d. Ship System MODS	0	2,200	1,300
e. Design & Analysis	14,900	28,437	15,480
f. Hardware Fab. & Proc	68,095	122,317	113,054
g. Test and Evaluation	10,635	9,354	14,308
h. Test Equipment	1,500	10,077	39,569
i. Engineering Support	705	9,881	8,390
j. Travel	0	250	250
k. Software Development	18,677	35,888	17,869
l. Other/Miscellaneous	1,332	1,075	907
Total	143,343	278,790	245,796

B. Budget Acquisition History and Planning Information ($ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/ Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1997	Budget FY 1998	Budget to Complete	Total Program
Product Development Organizations										
Standard Missile Co	CPAF				0	0	97,995	165,940	TBD	383,758
Lockheed Martin	CPFF				0	0	14,295	41,646	TBD	83,820
NSWC/Dahlgren	WR				0	0	2,627	10,931	TBD	23,308

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE: February 1998

BUDGET ACTIVITY: 5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE: 0604867C Navy Area

PROJECT: 2263

Contractor or Government Performing Activity	Contract Method/ Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1997	Budget FY 1998	Budget to Complete	Total Program
APL/JHU	RCP				0	0	4,195	10,250	TBD	22,445
Motorola	CPAF				0	0	0	6,000	TBD	11,550
SPAWAR	RCP				0	0	1,250	6,176	TBD	12,353
Vitro	CPAF				0	0	515	3,275	TDB	6,540
United Defense	CPFF				0	0	0	675	TBD	1,875
Miscellaneous					0	0	3,131	1,075	TBD	4,909
Support and Management Organizations										
NSWC Dahlgren					0	0	1,816	3,750	TBD	8,596
NSWC/China Lake					0	0	500	1,500	TBD	3,000
NSWC/Indian Head					0	0	791	2,350	TBD	4,841
Vitro					0	0	245	750	TBD	1,745
SPA					0	0	0	500	TBD	1,000
TSC					0	0	300	450	TBD	1,200
NAVSEA					0	0	2,000	3,000	TBD	8,000
Miscellaneous					0	0	1,332	1,091	TBD	3,330
Test and Evaluation Organizations										
NAWC/ Pt Mugu					0	0	75	1,810	TBD	2,385
NSWC Port Hueneme					0	0	735	1,951	TBD	4,536
NSWC/Dahlgren					0	0	6,968	1,500	TBD	9,468
NAWC/China Lake					0	0	500	550	TBD	1,650
SSDC Army					0	0	2,015	10,077	TBD	51,661
White Sands Missile Range					0	0	543	680	TBD	7,973
Pacific Missile Range Facility					0	0	1,515	398	TBD	2,413
Arnold Eng					0	0	0	400	TBD	900
Holloman AFB					0	0	0	1,000	TBD	2,500

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)			DATE: February 1998
BUDGET ACTIVITY: 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE: 0604867C Navy Area		PROJECT: 2263

Contractor or Government Performing Activity	Contract Method/ Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1997	Budget FY 1998	Budget to Complete	Total Program
Miscellaneous					0	0	0	1,065	TBD	2,173

B. Budget Acquisition History and Planning Information Continued ($ in Thousands)

Government Furnished Property:

Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Property									
Support and Management Property									
Test and Evaluation Property									
Subtotal Product Development					124,008	245,968	180,582		550,558
Subtotal Support and Management					6,984	13,391	11,337		31,712
Subtotal Test and Evaluation					12,351	19,431	53,877		85,659
Total Project					143,343	278,790	245,796		667,929